



INTERNATIONAL CIVIL AVIATION ORGANIZATION

**REPORT OF THE TWENTIETH MEETING OF THE
ASIA/PACIFIC AIR NAVIGATION PLANNING AND
IMPLEMENTATION REGIONAL GROUP
(APANPIRG/20)**

Bangkok, Thailand, 7 to 11 September 2009

The views expressed in this Report should be taken as those of the APANPIRG and not of the Organization. This Report will be presented to the Air Navigation Commission/Council and any formal action taken will be published in due course as a supplement to the Report.

Approved by the Meeting
and published by the ICAO Asia and Pacific Office

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PART I — HISTORY OF THE MEETING

PART I - HISTORY OF THE MEETING

1.1 Introduction

1.1.1 The Twentieth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/20) was held in Bangkok, Thailand from 7 to 11 September 2009 at the ICAO Asia/Pacific Regional Office.

1.2 Attendance

1.2.1 The meeting was attended by 111 participants from 25 Member States, 6 International Organizations (IATA, IACA, IFALPA, IFATCA, CANSO and IBAC) and one service provider (SITA).

1.2.2 A list of participants is given at **Attachment 1** to the Report.

1.3 Opening of the meeting

*Welcome address by Mr. Mokhtar A. Awan, Regional Director,
ICAO Asia/Pacific Office*

1.3.1 Mr. Awan welcomed the participants from the APANPIRG Member States and the International Organizations and recalled the Council Decision on the changes to the membership of the Group to ensure maximum participation in the planning and implementation activity. He informed the meeting on the appointment of Mr. Raymond Benjamin as the new Secretary General of ICAO and his assumption of duties from 1st August 2009.

1.3.2 Mr. Awan acknowledged the continued support extended by the member States on ICAO Regional office's 60th anniversary celebrations held on 13th and 14th July 2009 and expressed gratitude on the spectacular representation at this event from member States both at the Exhibition and in the Seminar.

1.3.3 In highlighting some of the regional issues from ICAO's perspective, he mentioned that ICAO had organized a PBN Seminar to provide information and guidance to States on implementation issues in addition to seminar on runway safety, testing of navigational and surveillance facilities, aerodrome certification course and an ADS-B seminar in the surveillance field. The Regional Office supported the OPMET Databank coordination, implementation of RVSM and RNP routes and air traffic flow management.

1.3.4 He expressed his appreciation and gratitude to the State Administrations for showing the political will and resilience in trying times when the world is struggling with one of the worst recession and the H1N1 pandemic. In addition committing financial resources to the various cooperative programmes by States speaks volumes of the commitment to safety. He also reiterated that the Group should be the guiding and coordinating organ for all activities conducted within ICAO concerning the Air Navigation System for the Asia/Pacific Region.

*Opening remarks by Mr. W. L. Wong, Senior Director, Changi Airport Advisory
Group, Civil Aviation Authority of Singapore and Chairman of APANPIRG*

1.3.5 In his opening remarks Mr. W. L. Wong, Chairman of APANPIRG welcomed the members. He recalled the Asia Financial crisis about a decade ago which saw a sharp decline in air traffic movements across the region. In 2009 the air traffic in the region has again taken a hit due to the global economic crisis. This has placed great pressures on civil aviation administrations,

regulatory authorities, air navigation service providers and aircraft operators to enhance efficiency of their services and help airlines reduce operating costs. In addition another major challenge given the global nature of civil aviation is the ever present threats of highly pandemic diseases.

1.3.6 The Chairman noted further that under the able leadership of the ICAO Asia/Pacific Regional Office and with the commitment of States, APANPIRG and its Sub-Groups and Task Forces had made notable progress in many areas over the last year. These are highlighted below:

- Development of Performance Framework Form and regional performance objectives;
- Establishment of Flight Procedure Design Office in China;
- Implementation of reduced horizontal separation based on RNP10 operations in the South China Sea and revised flight allocation scheme;
- Adoption of the interim Regional PBN Implementation; and
- ATCA Award for ICAO Asia Pacific Air Traffic Flow management task force for the contribution of quality, safety and efficiency of air traffic control.

1.3.7 Mr. Wong acknowledged that, although much had been achieved since APANPIRG/19, there was still a lot to do. There were also areas of concern. For example, there remained an urgent need to resolve the satellite data link technical issues within this region. Without sufficient coverage of data link communications it would be difficult to apply reduced horizontal separation thus making it difficult to implement the next phase of enhancements drawn up by APANPIRG. He also touched upon the need to review the current route structure to support the projected traffic flows in the medium and long terms. He reiterated that with the adoption of the interim Regional PBN implementation Plan, all States should commence PBN planning in accordance with the PBN Regional Plan.

1.4 Officers and Secretariat

1.4.1 Mr. W. L. Wong, Senior Director, Changi Airport Advisory Group, CAA Singapore, Chairman of the APANPIRG, presided over the meeting.

1.4.2 Mr. Mokhtar A. Awan, ICAO Regional Director, Asia/Pacific Office, was the Secretary of the meeting, assisted by Mr. N. C. Sekhar, Regional Officer/AGA.

1.4.3 The meeting was also assisted by Mr. H. V. Sudarshan, Regional Planning Officer, and Capt. Dave VanNess Implementation and Resource Development Coordinator Performance Based Navigation Programme (FLS) ICAO Headquarters, Mr. Andrew Tiede and Mr. Kyotaro Harano, Regional Officers/ATM, Mr. Li Peng and Mr. S. Saraswati, Regional Officers/CNS, Capt. Fareed Shah, Regional Officer/FS, Mr. Christopher F. Keohan, Regional Officer/MET and Ms. Sarangtip Sundarachampaka, Administrative Officer, ICAO Asia/Pacific Regional Office.

1.5 Agenda of the Meeting

1.5.1 The meeting adopted the following agenda:

- Agenda Item 1 Follow-up on the outcome of APANPIRG/19 Meeting
 - 1.1 Review of the action taken by the ANC and the Council on the Report of APANPIRG/19
 - 1.2 Review Status of Implementation of APANPIRG/19 Conclusions and Decisions
 - 1.3 Review Status of Implementation of APANPIRG Outstanding Conclusions and Decisions
- Agenda Item 2 Global and Inter Regional Activities
- Agenda Item 3 Regional Air Navigation Planning and Implementation Issues
 - 3.0 Regional and National Performance Framework
 - 3.1 AOP
 - 3.2 ATM/AIS/SAR
 - 3.3 RASMAG
 - 3.4 CNS/MET
 - 3.5 ATS Coordination Group Activities
 - 3.6 Other Air Navigation Matters
- Agenda Item 4 Regional Air Navigation Deficiencies
- Agenda Item 5 Future Work Programme
- Agenda Item 6 Any other business

1.6 Working Arrangements, Language and Documentation

1.6.1 The working language of the meeting was English inclusive of all documentation and this Report. Information Papers (IP) and Working Papers (WP) considered by the meeting are listed in the **Attachment 2** to this Report.

1.7 Conclusions and Decisions - Definition

1.7.1 The APANPIRG records its actions in the form of Conclusions and Decisions with the following significance:

- 1) Conclusions deal with matters which, in accordance with the Group's Terms of Reference, require the attention of States or actions by ICAO in accordance with established procedures; and

- 2) Decisions deal with matters of concern only to the APANPIRG and its contributory bodies.

1.7.2 Lists of Conclusions and Decisions are given on pages i-6 to i-9.

1.8 Terms of Reference of APANPIRG

1.8.1 The Terms of Reference of APANPIRG was approved by the Council of ICAO (6th Meeting of its 171st Session on 27 February 2004) and revised consequent to the decision of the Council [C- DEC 183/9, March/April 2008]. The revised terms of reference are:

1. Membership

All ICAO Contracting States, who are service providers in an air navigation region and part of that region's ANP, should be included in the membership of that region's PIRG. Furthermore user States are entitled to participate in any other PIRG meetings as a non member. International Organisations recognised by the Council may be invited as necessary to attend PIRG meetings as observers.

2. The Terms of Reference of the Group are:

- a) to ensure continuous and coherent development of the Asia/Pacific Regional Air Navigation Plan and other relevant regional documentation in a manner that is harmonized with adjacent regions, consistent with ICAO SARPs and Global Air Navigation Plan for CNS/ATM Systems (DOC 9750) and reflecting global requirements;
- b) to facilitate the implementation of air navigation systems and services as identified in the Asia/Pacific Regional Air Navigation Plan with due observance to the primacy of air safety, regularity and efficiency; and
- c) to identify and address specific deficiencies in the air navigation field.

3. In order to meet the Terms of Reference, the Group shall:

- a) review, and propose when necessary, the target dates for implementation of facilities, services and procedures to facilitate the coordinated development of the Air Navigation Systems in the Asia/Pacific Region;
- b) assist the ICAO Asia/Pacific Regional Office in fostering the implementation of the Asia/Pacific Regional Air Navigation Plan;
- c) in line with the Global Aviation Safety Plan (GASP), facilitate the conduct of any necessary systems performance monitoring, identify specific deficiencies in the air navigation field, especially in the context of safety, and propose corrective action;
- d) facilitate the development and implementation of action plans by States to resolve identified deficiencies, where necessary;
- e) develop amendment proposals to update the Asia/Pacific Regional Air Navigation Plan to reflect changes in the operational requirements;

- f) monitor implementation of air navigation facilities and services and where necessary, ensure interregional harmonization, taking due account of organizational aspects, economic issues (including financial aspects, cost/benefit analyses and business case studies) and environmental matters;
- g) examine human resource planning and training issues and propose where necessary human resource development capabilities in the region that are compatible with the Asia/Pacific Regional Air Navigation Plan;
- h) review the Statement of Basic Operational Requirements and Planning Criteria and recommend to the Air Navigation Commission such changes as may be required in the light of new developments in the air navigation field;
- i) request financial institutions, on a consultative basis as appropriate to provide advice in the planning process;
- j) maintain close cooperation with relevant organizations and State grouping to optimize the use of available expertise and resources; and
- k) conduct the above activities in the most efficient manner possible with a minimum of formality and documentation and call meetings of the APANPIRG when deemed necessary to do so.

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List of Conclusions

Conclusion 20/1	– Performance Framework Workshop/Seminar
Conclusion 20/2	– Asia Pacific Regional Performance Objectives
Conclusion 20/3	– Align Regional & National Performance Objectives
Conclusion 20/4	– Asia/Pacific Performance Metrics
Conclusion 20/5	– Data Collection for Regional Metrics
Conclusion 20/7	– Adopt Interim Strategy for Implementation of New Flight Plan Format
Conclusion 20/8	– Notification of State Transition Date to New Flight Plan Format
Conclusion 20/9	– SSR Code Coordination with ORCAM Secretariat
Conclusion 20/10	– ATFM Compliance-Advice to Airlines and Airports
Conclusion 20/11	– ATFM Steering Group and Concept of Operations
Conclusion 20/12	– Adopt ATFM Communications Manual
Conclusion 20/13	– Conduct Regional ATFM Survey
Conclusion 20/15	– Survey of RNP 4 Equipage and Approvals
Conclusion 20/16	– Assistance to States to Implement Electronic Terrain and Obstacle Data (eTOD)
Conclusion 20/17	– SAR Guidance on 121.5 MHz Search Planning
Conclusion 20/18	– Provide SAR 121.5 MHz Guidance to ICAO/IMO JWG
Conclusion 20/20	– Adopt RVSM Minimum Monitoring Requirements
Conclusion 20/22	– Provide Annual Update of RVSM Approvals to RMAs
Conclusion 20/23	– Adopt RVSM Monitoring Impact Statement
Conclusion 20/25	– Adopt En-route Monitoring Agency (EMA) Handbook
Conclusion 20/27	– ATN/AMHS Guidance Material
Conclusion 20/28	– Short-term procedure for Global AMHS address Coordination
Conclusion 20/29	– AMHS Addressing Scheme
Conclusion 20/30	– Revision of FASID Tables CNS-1B, CNS-1C and CNS-1E
Conclusion 20/31	– State and Operator aircraft information for GOLD

Conclusion 20/32	– Second Satellite Data-link Operational Continuity Meeting
Conclusion 20/33	– Coordinate Implementation of Reduced Horizontal Separations with CSPs
Conclusion 20/34	– Technical Limitations in Satellite Data Link Communications Capability
Conclusion 20/35	– Asia-Pacific Flight Procedure Programme
Conclusion 20/36	– Preparation for PBN Implementation
Conclusion 20/37	– Guidance material for PBN Implementation
Conclusion 20/39	– RNAV Human Factors
Conclusion 20/40	– PBN Implementation Progress Report Template
Conclusion 20/41	– Asia/Pacific Regional PBN Implementation Plan
Conclusion 20/42	– PBN Safety Assessment Training
Conclusion 20/43	– RNP AR Approach Implementation
Conclusion 20/45	– Sharing Information on ICAO Panels/SGs
Conclusion 20/46	– Revision of the Strategy for the Provision of Navigation Services in the Asia/Pacific Region
Conclusion 20/48	– Flight Inspections and Validation of Flight Procedures
Conclusion 20/49	– Update of procedures and infrastructure
Conclusion 20/51	– Workshop on ADS-B OUT equipage requirement
Conclusion 20/52	– Table CNS 4A and Table CNS 4B
Conclusion 20/53	– Revised Guidelines for Development of ADS-B Implementation Plan by States
Conclusion 20/54	– Regional ADS-B Equipage Requirement
Conclusion 20/55	– Forward Fitment Requirements for SA Aware and FDE Functionality
Conclusion 20/56	– Coordination for SSR MODE S II Codes
Conclusion 20/57	– Planning Criteria for SSR Mode S II Code Assignment
Conclusion 20/58	– ICAO Position for the World Radio Communication Conference - 2011(WRC-11) Agenda Items
Conclusion 20/60	– Extension of the ISCS-G2 and the implementation of the WAFS Internet file server (WIFS)

Conclusion 20/61	– Replacement of ISCS-G2
Conclusion 20/62	– Harmonization of procedures for OPMET data issuance
Conclusion 20/63	– Improvement of OPMET data availability for AOP aerodromes
Conclusion 20/64	– Improvement of OPMET data availability for non-AOP aerodromes
Conclusion 20/65	– Replace FASID Tables MET 4A and 4B by the ROBEX Handbook
Conclusion 20/66	– Replace FASID Table MET 4C by the Asia/Pacific regional OPMET data banks interface control document
Conclusion 20/67	– Cost Recovery by Volcano Observatories
Conclusion 20/68	– Expanded WV SIGMET Test Development
Conclusion 20/69	– Implementation of SIGMET on Radioactive Clouds and Aerodrome Warnings on Tsunami
Conclusion 20/70	– Training on QMS
Conclusion 20/72	– Ionospheric Data Collection – Focal Point of Contact
Conclusion 20/73	– Adopt GOLD to replace FOM
Conclusion 20/74	– Removal of the APANPIRG Air Navigation Deficiency AP-MET-15
Conclusion 20/75	– MET deficiencies to be added to the APANPIRG list of Air Navigation Deficiencies
Conclusion 20/76	– Continuation of CAEMSA-SP

List of Decisions

Decision 20/6	–	Dissolution of Western Pacific/South China Sea RVSM Scrutiny Working Group
Decision 20/14	–	Support for Global ICD for AFTN AIDC
Decision 20/19	–	ATM/AIS/SAR Task List
Decision 20/21	–	Expand use of safety monitoring data
Decision 20/24	–	En-route Monitoring Agency (EMA)
Decision 20/26	–	Revision of Subject/Tasks List of ATNICG
Decision 20/38	–	Regional RAIM prediction System
Decision 20/44	–	PBN Task Force Activities
Decision 20/47	–	Guidance material for flight inspection/validation of ADS-B ground stations
Decision 20/50	–	Subject/Tasks List of ADS-B Study and Implementation Task Force
Decision 20/59	–	Use of the public Internet to access OPMET data and WAFS forecasts
Decision 20/71	–	Updated Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group

PART II — REPORT ON AGENDA ITEMS

AGENDA ITEM 1: FOLLOW-UP ON THE OUTCOME OF APANPIRG/19 MEETING

- Agenda Item 1.1: Review of the ANC actions on the APANPIRG/19 Report
- Agenda Item 1.2: Review of status of implementation of APANPIRG/19 Conclusions and Decisions
- Agenda Item 1.3: Review of status of implementation of APANPIRG outstanding Conclusions and Decisions

Agenda Item 1: Follow-up on the Outcome of APANPIRG/19 Meeting

1.1 Review of the ANC actions on the APANPIRG/19 Report

1.1 The meeting was presented with actions taken by the Air Navigation Commission (ANC) during its review and approval of the Report of the nineteenth meeting of the ASIA/PAC air navigation planning and implementation regional group (APANPIRG) held in Bangkok, Thailand, from 1 to 5 September 2008. The Meeting noted the specific actions taken by the ANC and the follow-up by the States and Secretariat on conclusions and decisions of the Meeting as contained in **Appendix A** to Agenda Item 1.2 of the Report. In the case of APANPIRG/19 Report, the meeting noted that as there were no specific items that required Council action, the said report was not submitted to the Council. The meeting was informed of the following highlights of the review undertaken by the Commission.

1.2 Referring to Conclusions 19/1 and 19/2 regarding the adoption of both regional and national performance framework, the meeting noted that the Commission welcomed the approach and confirmed the need for the APANPIRG to take into account user expectations in the development of performance framework forms.

1.3 In relation to paragraphs 3.2.37 and 3.2.38 of the report, the meeting was informed that the Commission, in order to encourage fuel savings, agreed that the States be encouraged to review SIDs on a case-by-case basis with a view to lifting speed restrictions where appropriate. The Commission, while concurring in principle with this initiative, however did not support the case-by-case approach and requested the Secretary General to address the issue on a global basis.

1.4 The Commission noted the concerns of APANPIRG with regard to ensuring the availability and sustainability of infrastructure required for satellite communication services (Conclusion 19/24 refers). Also, it was noted that the same issue was highlighted by the North Atlantic Systems Planning Group (NAT SPG) during the Conference on the Economics of Airports and Air Navigation Services (CEANS) held in Montreal in September 2008. Consequently, the CEANS developed a recommendation calling on ICAO to undertake a case study on the ownership and control of the air navigation services infrastructure, including the development of a draft service level agreement for use by air navigation service providers (ANSPs), to ensure that private third party service providers perform in line with recognized safety and performance requirements. The meeting was apprized that the Commission, while noting these developments in different regions, requested the Secretariat to address the subject of ensuring availability of satellite communication (SATCOM) in a comprehensive manner.

1.5 The meeting noted that Commission concurred with the view of APANPIRG in Conclusion 19/29 which called on ICAO to expedite development of separation minima for area navigation (RNAV)5, RNAV2, RNAV1 and Basic RNP1 routes. The meeting was apprized that this task had already been taken up by the Separation and Airspace Safety Panel (SASP), which is developing Standards and Recommended Practices (SARPs) on the basis of obstacle clearance criteria for separation of aircraft in terminal airspace with a target date of 2010.

1.6 The meeting was pleased to note that the Secretariat had already taken follow-up action in response to Conclusion 19/49 and that the required guidance developed on this subject of period of validity of TAF included in the HF VOLMET broadcasts had been subsequently sent to the ASIA/PAC States.

1.7 The meeting was informed that the action called for in Conclusion 19/50 was to include a provision for multiple occurrences of operationally significant maximum or minimum temperatures in a 30-hour aerodrome forecast (TAF), establishment of an amendment criteria for the temperature group in the TAF and developing an explicit definition of the geographical area that the TAF covers with consistency between this definition for the TAF and the aerodrome routine meteorological report (in meteorological code form) METAR. Supporting the request of APANPIRG, the meeting noted that the Commission called upon the Secretary General to address the issues in Conclusion 19/50, with the assistance of the Aerodrome Meteorological Observation and Forecast Study Group.

1.8 Recognizing the increased importance and benefits of CNS/ATM systems implementation in reducing the impact of aviation emissions on the global climate, and the consequent need to have a common methodology to assess environmental benefits due to operational efficiencies, the meeting noted that the Commission endorsed the related Conclusion 19/56. It was noted that the task of developing a common methodology to assess environmental benefits of CNS/ATM systems was already included in the work programme of the Committee Aviation Environmental Protection.

1.9 The Meeting thanked the ANC for their valuable guidance on various activities of the APANPIRG and that it would be taken into account in the development of ongoing work programme of the region.

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1.2 Review of Status of Implementation of APANPIRG/19 Conclusions and Decisions

1.2.1 The meeting reviewed the progress made on the APNPIRG/19 Conclusions and Decisions.

1.2.2 The actions taken by States and the Secretariat on the above mentioned Conclusions and Decisions were reviewed and the updated list is provided in **Appendix A** to the Report on Agenda Item 1.2. This updated list is in the new format in line with the ICAO Business Planning and Performance based approach

1.2.3 The meeting noted that out of the 48 Conclusions and 9 Decisions action has been taken to close/complete 43 Conclusions and 9 Decisions. Action on the remaining 5 Conclusions is ongoing.

1.2.4 The meeting acknowledged that significant progress had been made in completing required action on the APANPIRG/19 Conclusions and Decisions and recommended continued action for completion of the few outstanding items in the list.

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APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Follow-up to APANPIRG/19 Conclusions/Decisions – Action Plan

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/1 D	Regional Performance Framework	That, a regional performance framework be adopted on the basis of ICAO guidance material and aligned with the Global Air Navigation Plan and the Global ATM Operational Concept. The performance framework should include identification of regional performance objectives taking into consideration user expectations (to be mapped against current work) and completion of regional performance framework forms based on the sample shown in Appendix A to the Report on Agenda Item 3.	Develop performance framework	ICAO APAC Office Sub Groups APANPIRG	Regional Performance objectives; Performance Framework Forms	Jun 2009 Revised target date July 2009.	COMPLETED APANPIRG/20 Conclusion 20/2 adopted regional performance frameworks , as well as a number of supporting Conclusions ~~ATM/AIS/SAR/ SG/19 and CNS/MET SG/13 prepared PFF forms and associated metrics for consideration by APANPIRG.~~ ANC action: Noted and that APANPIRG is requested to take action into account the user expectations in the development of performance framework forms.

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/2 D	National Performance Framework	That, States be invited to adopt a national performance framework on the basis of ICAO guidance material and aligned with the regional performance objectives, the regional air navigation plan and the Global ATM Operational Concept. The performance framework should include identification of national performance objectives taking into consideration user expectations (to be mapped against current work) and completion of national performance framework forms based on the sample shown in Appendix A to the Report on Agenda Item 3.	Notify States	ICAO APAC Office States	State Letter National Performance objectives; Performance Framework Forms	Feb 2009 TBD	COMPLETED State letter dated 15 January ICAO Special Implementation Project – Workshop On the development of national performance framework to achieve a global ATM system was conducted in BKK from 9-13 March 2009. ANC action: Noted and that states of Asia/Pacific Regions were requested to take action into account the user expectations in the development of performance framework forms.

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/3 A D	Assistance in South West Pacific Small Island States and Mongolia, Myanmar and Timor Leste in implementing the requirements of aerodrome certification and SMS	That, in recognizing the importance on the implementation of Annex 14, Volume I provisions related to aerodrome certification and SMS in the South West Pacific Small Island States and Mongolia, Myanmar and Timor-Leste, ICAO considers providing assistance to these States in order to build their capacity to provide the required services in a sustainable and cost efficient manner. <i>[Note: An appropriate form of providing assistance could include establishment of an ICAO technical cooperation project with funding sought from donor agencies.]</i>	Assist in establishment of TC Project	ICAO HQ/ICAO APAC Office	appropriate assistance Project	2009/ 2010	ONGOING SL dated 13/02/09 sent to these States to update status on implementation. ANC: Supported for the establishment of ICAO TC Project. Myanmar, Mongolia and Palau have provided the updated status to ICAO APAC office. <i>TCB has commenced preparing an IFFAS application for provision of assistance to the States identified</i>

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
D 19/4 A D	Dissolution of the Regional Performance Framework Task Force (RPF/TF)	That, recognizing the performance based planning process utilizing “Performance Framework Forms (PFF)” promulgated by ICAO during 2008 had overtaken the Terms of Reference of the Regional Performance Framework Task Force (RPF/TF), the RPF/TF be dissolved. .					COMPLETED

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
D 19/5 A D	Dissolution of the RVSM/TF	That, following the widespread and safe implementation of RVSM throughout the Asia/Pacific Regions over a 10 year period, the Asia/Pacific RVSM Implementation Task Force (RVSM/TF) be dissolved, with effect from the close of the RVSM/TF/34 meeting (one year review of China RVSM) in late 2008, and any residual work items be allocated to the ATM/AIS/SAR Sub-Group. <i>Note: In dissolving the RVSM/TF, APANPIRG places on the record its highest commendation and appreciation to all parties associated with the RVSM/TF for the continuous implementation of RVSM and the very positive and quantifiable beneficial effects on safety, efficiency and the environment that have resulted directly from the work of the RVSM/TF.</i>	Notify States	ICAO APAC Office	State Letter	Mar 2009	COMPLETED RVSM/TF/34 meeting held in Beijing China 1-3 December 2008 actioned the dissolution of the RVSM/TF

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
D 19/6 A, D, E	Establishment of an ICAO Flight Plan & ATS Message Implementation Task Force	That, an Asia/Pacific ICAO Flight Plan & ATS Message Implementation Task Force (FPL&AM/TF), with terms of reference as outlined in Appendix C to the APANPIRG/19 Report on Agenda Item 3.2, be established to develop a regional transition strategy and procedures to ensure the streamlined implementation of the amended ICAO flight planning and associated ATS Message provisions.	Establish Task Force	ICAO APAC Office	Schedule first meeting First meeting of FPL&AM/TF held in April 2009	Second quarter 2009	COMPLETED Task Force created by State Letter Ref.:T3/10.1.20 AP009/09 (ATM) dated 19 January 2009. First meeting of FPL&AM TF conducted 17-20 March 2009, interim regional; strategy developed. FPL&AM TF/2 scheduled November 09 ANC: Noted and that the Secretariat is developing more detailed guidance scheduled to be released in Feb 2009

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C19/7 A D	RNP 4 capability for operators	That, recognizing the significant benefits expected from the implementation of 30 NM longitudinal separation based on RNP 4, operators of Pacific fleets be urged to equip with RNP 4 avionics for oceanic airspace operations and obtain approval from the States of Registry/Operators as early as possible, but no later than 2012.	Notify States and air space users	ICAO APAC Office	State Letter	Dec 2008	COMPLETED State Letter Ref.:T3/10 AP- ATM 0063 dated 20 February 2009.
C 19/8 A D	Conduct Regional Runway Safety Seminar/ Workshop	That, noting the critical nature and persistent occurrence of runway incursions, the ICAO Asia/Pacific Regional Office, with assistance from States experienced in runway safety management and in conjunction with the COSCAPS of South Asia, South East Asia and North Asia, conduct a 3-day runway safety seminar/workshop during 2009.	Conduct Seminar/ Workshop	ICAO APAC Office, COSCAPs	Seminar/ Workshop	2009	COMPLETED Workshop conducted 7-9 April 2009, results reported to ATM/AIS/SAR/ SG/19

APANPIRG/20
Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/9 A D E	Support for Ad-Hoc GOLD Working Group	That, recognizing the many benefits to be gained from the global application of harmonized FANS data link operational procedures, APANPIRG supports the work being undertaken under the auspices of the Ad-Hoc GOLD Working Group to produce a FANS Global Operational Data Link document (GOLD) and invites the Asia/Pacific Regional Office to act as the regional focal point for the Ad-Hoc GOLD Working Group.	Participation in the working group	ICAO APAC Office	Draft GOLD	Mar 2009 Revised August 2009	ONGOING CLOSED ATM 1 working by correspondence with Ad-Hoc Working Group on this issue. Circulation draft of GOLD expected August 2009; target for finalization is December 2009. APANPIRG 20 adopted Conclusion 20/73 to replace the FOM with the GOLD

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/10 A D	Future date-time for NOTAMC and NOTAMR	Recognizing that the concerns raised in APANPIRG Conclusion 18/14 relating to use of future date-time in NOTAMC and NOTAMR have been included in the Air Navigation Commission work programme for formal resolution by 2010, States be encouraged to use relevant guidance material in the Aeronautical Information Services Manual (Doc 8126) and the Asia/Pacific Operating Procedures for AIS Dynamic Data (OPADD) in the application of Annex 15 SARPs.	Notify States	ICAO APAC Office	State Letter	Dec 2008	CLOSED State letter Ref.:T3/10.0, 3/10.1.6 AP001/09 (ATM) dated 05 January 2009 AIS-AIM/SG considering as amendment proposal to Annex 15
C 19/11 A D	Update SAR Matrix including guidance material	That, the updated format for the SAR Capability Matrix Table and explanatory text shown in Appendix K to the APANPIRG/19 Report on Agenda Item 3.2 be adopted and the explanatory text be included as a perpetual attachment to the SAR Capability Matrix, to serve as guidance to States when filling in the Matrix.	Publish on website	ICAO APAC Office	Published on website	Oct 2009	COMPLETED

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C19/12 A D	Accelerated Data Link Implementation in the Manila Flight Information Region (FIR)	That, to enable the early realization of the full benefit of data link operation and the implementation of reduced lateral and longitudinal separations throughout the South China Sea airspace, the Philippines be invited to expedite implementation of ADS-C and CPDLC data link services in the Manila FIR.	Notify Philippines	ICAO APAC Office	State letter	Dec 2008	COMPLETED State Letter Ref.: T 3/8.12.1, T 3/10.0 – AP- ATM0350, 12 December 2008
D 19/13 A D	ATM/AIS/SAR Task List	That, the ATM/AIS/SAR Sub-Group Task List and attachments contained in Appendix A to the ATM/AIS/SAR/SG/18 Report on Agenda Item 9 be adopted as the current work programme for the ATM/AIS/SAR Sub-Group of APANPIRG.	Notify ATM/AIS/SAR/SG	ICAO APAC Office	ATM/AIS/ SAR SG informed. Paper prepared	Jun 2009	COMPLETED <i>WP/8 presented to ATM/AIS/SAR/ SG/19</i>
C 19/14 A D	Approval of China RMA as Asia Pacific RMA	That, having met all requirements established by the Regional Airspace Safety Monitoring Advisory Group (RASMAG), the China RMA be approved as an APANPIRG Asia/Pacific RVSM Regional Monitoring Agency with responsibility for all sovereign RVSM airspaces in China.	Update RASMAG List of Competent Agencies Notify States	ICAO APAC Office ICAO APAC Office	List updated State Letter	Oct 2008 Dec 2008	COMPLETED State Letter Ref.: T 3/10.0, T3/10.1.17 – AP121/08 (ATM) , 12 September 2008

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/15 A D	Enhanced communications between States and RVSM RMAs	That, noting the Annex 6 provisions for the global long term monitoring of airframes used in RVSM operations and the critical role of Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) in monitoring the safety of RVSM operations, the Regional Office draw the attention of States to the Long Term Height Monitoring Actions promulgated by RASMAG. In particular, States are encouraged to immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs.	Notify States	ICAO APAC Office	State Letter	Mar 2009	COMPLETED Incorporated into Regional Impact Statement prepared by RASMAG for consideration by APANPIRG/20
D 19/16 D	Revision to the Subject/Tasks List of ATNICG	That, the Revised Subject/Tasks List of the ATNICG provided in Appendix A to the Report on Agenda Item 3.4 be adopted.	Notify ATNICG	ICAO APAC Office	ATNICG informed. Paper prepared.	May 2009	COMPLETED

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/17 D	Asia/Pacific Aeronautical Telecommunication Network System Security Policy	That, the updated “Asia/Pacific Aeronautical Telecommunication Network System Integrity Policy” provided in Appendix B to the Report on Agenda Item 3.4 be adopted as “Asia/Pacific Aeronautical Telecommunication Network System Security Policy”.	Publish on website	ICAO APAC Office	Published on website. States notified	Oct 2008	COMPLETED. State letter dated 14/10/08
C 19/18 A D	ATS Message Management Center (AMC) Software	That, to facilitate implementation and management of ATN in Asia/Pacific Region, ICAO be urged to facilitate transfer of Eurocontrol AMC Software to Aerothai and to allow Aerothai to modify the Software to suit the requirements of Asia/Pacific Region.	Coordinate with parties concerned. Prepare Issue Form	ICAO HQ ICAO APAC Office	MOU signed and AMC software transferred. Sent to HQ	May 2009. Revised June 2009. Dec 2008	ONGOING Coordination being carried out with HQ and Aero Thai. ANC: Noted that the secretariat is reviewing the feasibility. COMPLETED
C 19/19 A D	Implementation of AIDC in Asia and Pacific Regions	That, States be urged to expedite implementation of AIDC between neighboring ATS facilities in accordance with the Regional Air Navigation Plan and the Asia/Pacific AIDC ICD.	Notify States	ICAO APAC Office	State Letter	Dec 2008	COMPLETED on 10/12/08

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/20 D	Adoption of ATN over IPS in addition to ATN over OSI	That, considering the inclusion of ATN over IPS SARPs in ICAO Annex 10, Volume 3 and to support global harmonization of ATN implementations, States hosting BBIS be urged to implement ATN over IPS in addition to ATN over OSI and complete this implementation of Dual Stack ATN (ATN/OSI and ATN/IPS) by 2011.	Notify States hosting BBIS.	ICAO APAC Office States	State Letter ATN over IPS	Dec 2008 2011	COMPLETED ANC- Noted
C 19/21 D	Amendment to Asia/Pacific Regional AMHS MTA Routing Policy	That, the revised Asia/Pacific AMHS MTA Routing Policy placed at Appendix C to the Report on Agenda Item 3.4 be adopted.	Publish on website	ICAO APAC Office	Published on website	Mar 2009	COMPLETED
C 19/22 D	Amendment to FASID Tables CNS – 1B and CNS – 1C	That, FASID Tables CNS – 1B ATN Router Plan and Table CNS – 1C AMHS Routing Plan, be amended by replacing them with the Tables provided in Appendices D and E to the Report on Agenda Item 3.4 in accordance with the established procedure.	Prepare amendment proposal	ICAO APAC Office	Amendment proposal processed	Mar 2009	COMPLETED amendment proposal processed
C 19/23 D	Amendment to Asia/Pacific AMHS Manual.	That, Annex E and Annex F provided in Appendix F to the Report on Agenda Item 3.4 be adopted as Annexes to the Guidance Document for AMHS Conformance Testing (AMHS Manual).	Publish on website	ICAO APAC Office	Published on website and States notified	Nov 2008	COMPLETED

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/24 A D E	Satellite Communications Service Performance	That, a) States and International Organizations be requested to liaise with satellite service providers to establish a mechanism to maintain and modernize the satellite communication infrastructure; and b) ICAO be invited to organize a meeting by the end 2008 for stakeholders to review the performance and provision of satellite data link communications in the Asia/Pacific Region and find a solution.	a) Notify States and Intl' Organizations	ICAO APAC Office	State Letter	Feb 2009	COMPLETED
			b) To organize a meeting	ICAO APAC Office	Meeting conducted	Dec 2008	COMPLETED
						Revised target date- April 2009	The postponed Meeting was held in August 2009
						Meeting further deferred due civil circumst ances in Thailand, now schedule d late August 2009	ANC: noting the similar developments in different Regions. Requested the secretariat to address the subject of ensuring availability of SATCOM in a comprehensive manner.

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/25 D	ASIA/PAC PBN Implementation Plan	That, the Asia/Pacific PBN Implementation Plan as provided in Appendix G to the Report on Agenda Item 3.4 be adopted and published as the interim Edition based on which, States be urged to developed their national PBN implementation plan and provide feedback to the ICAO Regional Office.	Notify States Publish on website	ICAO APAC Office	State letter. Published on website and States notified	Nov 2008	COMPLETED ANC: Noted
C 19/26 A D	Investigation DME based RNAV	That, in the interest of efficiency, States with DME coverage extending beyond their FIRs be requested to consider allowing neighboring States to develop PBN procedures utilizing these DMEs.	Notify States with extended DME coverage	ICAO APAC Office	State Letter	Feb 2009	COMPLETED on 24/03/09

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/27 D	Flight Procedure Design Office	That, ICAO continues to develop the concept of a Flight Procedure Design Office taking into account proposals submitted by the States with emphasis on the role, responsibility and financial mechanisms.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue form sent to HQ Establishmen t of FPO	Dec 2008 May 2009	COMPLETED China selected to host FPP ANC Action: noted that the Secretariat is on the task of studying the proposals received and would take into account the concerns expressed by the ANC in this regard.
C 19/28 A D	Continuous Descent Final Approach (CDFA) and Baro- VNAV	That, in order to reduce the likelihood of CFIT accidents, States be urged to a) review non-precision approach procedures with LNAV lines of minima to include CDFA profile; and b) include the Baro-VNAV design in the current and new RNP APCH approaches and consequent LNAV/VNAV approach minima.	Notify States	ICAO APAC Office	State Letter	Oct 2008	COMPLETED State letter dated 14/10/08 ANC: Noted

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/29 D	Separation Standards for PBN	That, ICAO be invited to expedite development and publication of separation standards for use in implementation of the PBN RNAV 5, RNAV 2, RNAV 1 and Basic-RNP 1 navigation specifications.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent to HQ development of separation standards for use in implementati on of the PBN RNAV 5, RNAV 2, RNAV 1 and Basic-RNP	Dec 2008 2010	COMPLETED ANC action: noted that the task has already been taken up by SASP and is developing SARPs on the basis of obstacle clearance criteria for separation of aircraft in terminal airspace with a target date of 2010.
D 19/30 D	Revision to the Terms of Reference of the PBN Task Force	That, the Revised Terms of Reference of the PBN Task Force provided in Appendix I to the Report on Agenda Item 3.4 be adopted.	Notify PBN Task Force	ICAO APAC Office	Paper prepared	Mar 2009	COMPLETED
C 19/31 D	Revision of the Strategy for the Provision of Navigation Services in the Asia/Pacific Region	That, the revised Strategy for the provision of navigation services provided in Appendix J to the Report on Agenda Item 3.4 be adopted and provided to States	Publish on website	ICAO APAC Office	Published on Website and States notified	Feb 2009	COMPLETED on 18/02/09. ANC- Noted

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/32 D	Testing of Navigation and Surveillance facilities Seminar	That, ICAO be invited to organize a seminar on 'Testing of Navigation and Surveillance facilities' in 2009 to address issues related to ground and flight inspection/validation.	Organize a Seminar	ICAO APAC Office	Seminar	Sep 2009	COMPLETED Seminar was conducted from 5 to 7 August 2009.
D 19/33 D	Subject/Tasks List of ADS-B Study and Implementation Task Force	That, the Subject/Tasks List for ADS-B Study and Implementation Task Force provided in Appendix L to the Report on Agenda Item 3.4 be adopted.	Notify ADS-B Study and Implementation Task Force	ICAO APAC Office	ADS-B S & I TF informed and paper prepared.	Apr 2009. revised May 2009	COMPLETED
C 19/34 D	Guidance Materials on Implementation of ADS-B	That, the following Guidance Materials on implementation of ADS-B Out Services be adopted for use by States in the Asia and Pacific Regions: - Reporting Probability of ADS-B update as shown in Appendix M ; - Reporting ADS-B Avionics fitment as shown in Appendix N ; - the performance criteria for multi-sensor fusion as shown in the Appendix O .	Publish on website and inform States	ICAO APAC Office	Published on website and States notified	Jan 2009	COMPLETED on 14/01/09

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/35 D	Guidelines for the development of ADS-B Implementation	That, States be advised to use the following guidelines for the development of ADS-B implementation plan. a) minimize capital and operating costs of ADS-B data facilities; b) give priority to provide coverage over major traffic flows; c) provide ADS-B coverage in areas within 150 NM from FIR boundaries; d) suitable sites with power, shelter, access routes and data communication links shall be preferred; and e) overlapping of ADS-B coverage is preferred.	Notify States	ICAO APAC Office	State Letter	Feb 2009	COMPLETED on 23/01/09
C 19/36 D	Sample Agreement for ADS-B Data Sharing	That, the sample Agreement for ADS-B Data Sharing and the cost apportionment framework provided in the Appendices P and Q respectively to the Report on Agenda Item 3.4 be adopted as the regional guidance material.	Notify States	ICAO APAC Office	State Letter	Feb 2009	COMPLETED on 14/01/09

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/37 D	Revised Mandate Regional ADS-B Out Implementation	States intending to implement ADS-B based surveillance service, be urged to	Notify States	ICAO APAC Office	State Letter	Nov 2008	COMPLETED. On 18/11/08 ANC action- Noted
		a) determine ADS-B OUT equipage mandates based upon the ability to provide ADS-B OUT separation services;					
		b) expedite the implementation of ADS-B OUT in accordance with the Regional Air Navigation Plan and the provision of separation services based on ADS-B OUT;					
		c) publish their equipage mandates as soon as possible, with a target publication date of no later than 2010 so that operators can plan ahead their forward purchasing and retrofit;	States		publish their ADS-B OUT equipage mandate	2010	
		d) choose a date after mid 2012 on which the ADS-B out equipage mandate will become effective in airspace served by ADS-B ground stations with sufficient transition period to enable fleet equipage.	States		ADS-B out equipage mandate will become effective in airspace served by ADS-B ground stations	After mid 2012	
		<i>Note: The implementation would require aircraft equipped with avionics compliant with either;</i>					

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
		1) <i>Version 0 ES as specified in Annex 10, Volume IV, Chapter 3, Paragraph 3.1.2.8.6 (up to and including Amendment 82 to Annex 10) and Chapter 2 of the Technical Provisions for Mode S Services and Extended Squitter (ICAO Doc 9871) (Equivalent to DO260) to be used till at least 2020. or</i> 2) Version 1 ES as specified in Chapter 3 of the Technical Provisions for Mode S Services and Extended Squitter (ICAO Doc 9871) (Equivalent to DO260A)					

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/38 A D	Support provision of VHF radio voice communication associated with ADS-B data sharing between adjacent States	That, States be urged to consider following regional policy on supporting provision of direct controller pilot communication capability associated with ADS-B data sharing between adjacent FIRs of States. “In order to provide radar like separation services using ADS-B, it is necessary for the controllers to have direct controller pilot communication (DCPC). In some cases, to achieve radar like separation services it may be necessary for the States to provide VHF radio voice communication services for use by adjacent States. It is therefore recommended that States capable to do so support provision of VHF radio voice communication services to adjacent States when this is required to support the delivery of ADS-B based separation services. Cost of such service provision shall be agreed between the States concerned.”	Notify States	ICAO APAC Office	State letter	Mar 2009	COMPLETED

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/39 D	Regional Surveillance Strategy for Asia/Pacific Region	That, the revised Regional Surveillance Strategy for Asia/Pacific Region provided in the Appendix R to the Report on Agenda Item 3.4 be adopted.	Publish on the web site.	ICAO APAC Office	Published on website and States notified.	Jan/Feb 2009	COMPLETED ANC- Noted
C 19/40 A D	Coordination for SSR Mode S Interrogator Identifier Code	That, a) in view of low density of SSR interrogator installations in the region, only Interrogator Identifier (and not Surveillance Identifiers) codes be used for SSRs Mode S in areas of overlapping coverage b) while implementing SSR Mode S, States should take into account following issues while assigning Interrogator Identifier codes for these installations: - for planning the implementation of SSR Mode S interrogators, administrations should ensure that the interrogators with overlapping coverage are not operating with the same Interrogator Identifier (II) codes. - where, the coverage of the interrogator extends beyond the boundaries of the State, The II code and PRF should be worked out in coordination with the ICAO	Notify States	ICAO APAC Office	State letter	Mar 2009	COMPLETED. State Letter dated 24 March 09

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
		Asia and Pacific Office and the neighboring States, and - administrations should inform the ICAO Asia and Pacific Office about the assigned II codes and PRFs for these installations.					
C 19/41 A D E	Contact Person for WRC-11 and active participation by the States in WRC-11 related national and regional activities	That, States be urged to a) nominate a Contact Person responsible for the preparation for WRC-11 in their administration and inform ICAO Asia and Pacific Office about the contact details of the nominated Contact Person; and b) actively participate in all the national and regional level activities related to the preparation for WRC-11.	Notify States	ICAO APAC Office	State Letter	Jan 2009	COMPLETED 20/01/09

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/42 A D	Providing ASIA/PAC States with information on recent and forthcoming developments to WAFS	That, in order to increase the regional awareness on the planned developments of the WAFS, SADIS and International Satellite Communication System (ISCS), the information provided by the WAFCs, as shown in Appendix S to the Report on Agenda Item 3.4 be circulated by the ICAO Regional Office to the States in the ASIA/PAC Region.	Notify States	ICAO APAC Office	State Letter	Oct 2008	COMPLETED 28 Oct 2008

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/44 D	Use of administrative messages for errors in the WAFS SIGWX forecasts	That,	Prepare Issue Form	ICAO APAC Office	Issue Form sent to HQ	Dec 2008	COMPLETED
		a) WAFSOPSG be requested to develop as soon as possible the procedures for the issuance of administrative messages by the WAFCs drawing attention to errors identified in the current WAFS SIGWX forecasts (in the BUFR code and PNG chart forms); and	Development of procedures	ICAO HQ	The procedures for the issuance of administrative messages by the WAFCs	2010	
		b) ICAO be invited to develop guidance for the meteorological offices and aviation users on the use of the above administrative messages.	develop guidance on the use of the above administrative messages.	ICAO HQ	Guidance	2010	
C 19/45 A D	Transition to ISCS 3 rd Generation	That, in view of the plans by the ISCS Provider State to upgrade the ISCS broadcast to a new 3 rd Generation service (ISCS 3G) by the end of 2009: a) the ISCS Provider State be urged to provide timely information to the ISCS user States on the planned changes including specifications of the hardware and software changes, transition timeline and expected cost implications for the users if any; and	Provide specifications Notify ISCS user States	ISCS provider State ICAO APAC Office	Specification information available State Letter	Mar 2009 Apr 2009	ONGOING State Letter sent T 4/8.1:AP-MET 0019/09 dated 27 Feb 2009. This Conclusion is proposed to be reinstated at APANPIRG/20 via CNS/MET SG/13 draft Conclusion 13/32 – Replacement of ISCS-G2

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
		b) the ISCS user States be urged to keep abreast of the planned developments through the established channels of communication with the ISCS Provider State and plan well in advance any resources required for the transition to the ISCS 3G; <i>Notes:</i> 1) <i>The ISCS Provider State will use the established network of ISCS focal points as its basis for keeping States informed.</i> 2) <i>The Secretariat will undertake the task to keep the list of ISCS focal points up-to-date to ensure efficient communication between the ISCS Provider State and the ISCS user States in the ASIA/PAC Region.</i> 3) <i>All information on the planned transition will be available on:</i> http://www.weather.gov/iscs					

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/46 D	Amendment proposal to TAF- related provisions in the ASIA/PAC Basic ANP and FASID (Doc 9673)	That, a) the amendment proposal to the ASIA/PAC Basic ANP, as presented in Appendix V to the Report on Agenda Item 3.4, be processed according to the established procedure; and b) the new format of FASID Table MET 1A, as presented in Appendix U to the Report on Agenda Item 3.4, be adopted and the ASIA/PAC States be invited to provide the necessary data to the Regional Office in order to issue an amendment proposal.	prepare amendment proposal Notify States	ICAO APAC Office ICAO APAC Office	amendment proposal to HQ State Letter	Sep 2008 Nov 2008	COMPLETED Amendment Proposal (APAC 08/29-MET:AP 123/08 (MET) 17 Sep 2008 approved COMPLETED Amendment Proposal (APAC 08/31 :AP133/08(MET) 1 Oct 2008 (approved)
C 19/47 D	Regional preparedness for timely implementation of the new TAF provisions	That, a) the Regional implementation plan for the new TAF provision presented in Appendix W to the Report on Agenda Item 3.4 be circulated to all ASIA/PAC States; and b) States be informed that the new TAF format should be used for all TAFs issued after 00 UTC on 5 November 2008.	Notify States Notify States	ICAO APAC Office ICAO APAC Office	State Letter State Letter	Sep 2008 Sep 2008	COMPLETED T 4/8.3.2: AP127/08(MET) 23 Sep 2008 COMPLETED T 4/8.3.2: AP129/08(MET) 29 Sep 2008

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/48 D	Test website for the transition to the new TAF format	That, States in the ASIA/PAC Region be invited to use the special website established by the U.S. NWS to facilitate the transition to the new TAF format and test their procedures for issuance of 30-hour TAF. <i>Note: The 30-hour TAF test website is accessed on:</i> http://www.weather.gov/os/aviation/taf_testbed.shtml	Notify States	ICAO APAC Office	State Letter	Sep 2008	COMPLETED T 4/8.3.2: AP129/08(MET) 29 Sep 2008

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/49 D	Guidance on the period of validity of TAF included in the HF VOLMET broadcasts	That, ICAO:	Prepare Issue Form	ICAO APAC Office	Issue form sent to HQ	Dec 2008	COMPLETED ANC- Noted
		a) be invited to urgently review the concerns expressed with regard to the non-suitability of 30-hour TAF for HF VOLMET broadcasts as described in detail in the report of CNS/MET SG/12 meeting; and		ICAO HQ	Review		COMPLETED
		b) provide urgent guidance to the States concerned taking into consideration the user requirements expressed by IATA and IFALPA, before the implementation date of the new TAF provisions.	guidance to the States	ICAO HQ	required guidance		COMPLETED T 4/6.1.1: AP124/08(MET) 17 September 2008

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/50 D	Issues related to TAF code	That, ICAO, in coordination with WMO be invited to consider the following issues related to TAF: a) providing explicit definition of the geographical area that the TAF covers with consistency between this definition for the TAF and METAR; b) establishment of amendment criteria for the temperature group in the TAF; and c) establishment of provision for multiple occurrences of operationally significant maximum or minimum temperatures in a 30-hour TAF.	Prepare Issue Form Review the issues concerning TAF	ICAO APAC Office ICAO HQ	Issue Form sent to HQ Amendment criteria to be included in Amendment 76 to Annex 3 as necessary; and guidance	Dec 2008 2011	COMPLETED ANC action-supported the request and called upon the Sec Gen to address the issues in Conclusion 19/50 with the assistance of AMOFSG

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/51 D	Coordination and Implementation of the Volcanic Ash Notification for Aviation	That States listed in FASID Table MET 3C be encouraged to implement the format VONA developed by the International Airways Volcano Watch Operations Group (IAVWOPSG) in order to: a) improve communication of information on volcanic activity to ACC, VAAC, and MWO; and b) provide feedback on the utility of the VONA and refinements that should be considered by the IAVWOPSG <i>VONA = Volcano Observatory Notice for Aviation</i>	Notify States	ICAO APAC Office	State Letter	Nov 2008	COMPLETED T 4/9.1 : AP171/08(MET) 28 Nov 2008
C 19/52 D	Update of ASIA/PAC Regional SIGMET Guide	That, the new SIGMET examples developed by Hong Kong, China and Australia given in Appendix Y to the Report on Agenda Item 3.4 be included in the new edition of the ASIA/PAC Regional SIGMET Guide.	Notify States	ICAO APAC Office	State Letter	Dec 2008	COMPLETED T 4/8.3.2 : AP185/08(MET) 17 Dec 2008

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
C 19/53 D	Convening MET/ATM TF meeting and organizing MET/ATM seminar	That, a meeting of MET/ATM Task Force be convened in 2009 to review and update the Work Programme of the group and prepare a programme for the second ASIA/PAC MET/ATM Seminar to be held in 2010. <i>Note: Coordination with the ATM/AIS/SAR Sub-group is essential for the planned meeting of the MET/ATM TF.</i>	Organize meeting	ICAO APAC Office	Meeting convened	Dec 2009	ON GOING
C 19/54 D	Improvements to aeronautical climatological information provision	That, ICAO, in coordination with WMO and IATA, be invited to: a) study the evolving user requirements for the provision of aeronautical climatological information, in view of the increasing importance of climatological data in the decision making process and strategic planning of airline operations; b) based on the results of the study, consider developing proposal for improvements to aeronautical climatological information provision.	Prepare Issue Form proposals for improvements to aeronautical climatological information.	ICAO APAC Office ICAO HQ	Issue form sent to HQ Appropriate provisions	Dec 2008 TBD	COMPLETED ANC action- In view of the important scope of this issue no action should be taken until the need for the provision of improved aeronautical climatological information be assessed by a conjoint ICAO/WMO meeting

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Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
D 19/55 D	Updated Subject/Tasks List of the CNS/MET Sub- group	That, the Subject/Tasks List of the CNS/MET Sub-group provided in Appendix A2 to the Report on Agenda Item 3.4 be adopted.	Notify CNS/MET SG	ICAO APAC Office	CNS/MET SG informed with paper prepared	Jul 2009	COMPLETED
C 19/56 C,D	Common methodology for environmental benefits	That, ICAO be invited to establish and maintain a simple and cost effective common methodology to assess and document environmental benefits to airspace and CNS/ATM planning initiatives.	Prepare Issue Form Common methodology	ICAO APAC Office ICAO HQ	Issue Form sent to HQ Appropriate guidance	Dec 2008 2010	COMPLETED ANC action- Noted that the task of developing a common methodology to assess environmental benefits of CNS/ATM systems is already included in the work program of CAEP.

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Appendix A to Report on Agenda Item 1.2

Conclusion/ Decision No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status as on 10 August 2009
D 19/57 A, C, D	Amendments to the Terms of Reference of the ATM/AIS/SAR/SG	That, amendments to the Terms of Reference of the ATM/AIS/SAR Sub Group be adopted to enable consideration of the Global Air Navigation Safety Plan in planning processes and ensure environmental initiatives are identified and progressed, as presented in Appendix B to the APANPIRG/19 Report on Agenda Item 5.	Notify ATM/AIS/SAR/SG	ICAO APAC Office	ATM/AIS/ SAR/SG informed with paper prepared	Jun 2009	COMPLETED , <i>ATM/AIS/SAR/ SG/19 informed of updated Terms of Reference</i>

*** Note:** ICAO has established the following Strategic Objectives for the period 2005-2010:

A: Safety - Enhance global civil aviation safety; **B: Security** - Enhance global civil aviation security; **C: Environmental Protection** - Minimize the adverse effect of global civil aviation on the environment; **D: Efficiency** - Enhance the efficiency of aviation operations; **E: Continuity** - Maintain the continuity of aviation operations; **F: Rule of Law** - Strengthen law governing international civil aviation.

1.3 Review of Status of Implementation of APANPIRG Outstanding Conclusions and Decisions

1.3.1 The meeting reviewed the progress made on the APANPIRG Outstanding Conclusions and Decisions up to its eighteenth meeting.

1.3.2 The actions taken by States and the Secretariat on the above mentioned Conclusions and Decisions were reviewed and the updated list is provided in **Appendix A** to the Report on Agenda Item 1.3.

1.3.3 The meeting noted that out of the 8 outstanding items, the follow-up actions on the 5 Conclusions have been completed and actions on 3 conclusions are ongoing. The meeting acknowledged that significant progress had been made in completing required action on the Outstanding APANPIRG Conclusions and Decisions.

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Status of outstanding Conclusions/Decisions – Action Plan

Concl/ Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 18/4 A D	Consequences of Global RVSM Long Term Height Monitoring	That, the Regional Office draw to the attention of the RVSM airspace safety monitoring agencies within the Asia Pacific Region the provisional global RVSM long-term height monitoring requirements recently proposed by the ICAO Separation and Airspace Safety Panel (ICAO SASP), and request that those agencies prepare a regional impact statement summarizing the estimated consequences for the Region, including consideration of numbers of airframes required to be monitored, for initial review by RASMAG/8 in late 2007.	Inform RMAs of long term height monitoring requirements and request they prepare impact statements	ICAO APAC Office	Report to RASAMAG	June 09	ONGOING RASMAG/8 (Dec 07) addressed these issues in detail and raised 6 Long Term Height Monitoring Actions Items. State letter issued on 31/1/08. RASMAG/11 (June 09) will finalize this work. COMPLETED APANPIRG 20 agreed to Conclusion 20/23 adopting the APAC RVSM Monitoring Regional Impact Statement

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Concl/ Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 18/7 D	Conduct Regional ATFM Seminar	That, noting the provisions of GPI- 6 <i>Air Traffic Flow Management</i> and the increasing numbers of actual and planned ATFM implementations occurring in the Asia/Pacific Region, the ICAO Asia/Pacific Regional Office conduct, with assistance from States experienced in ATFM, a 3-day Air Traffic Flow Management Seminar during 2008.	Conduct seminar	ICAO APAC Office/States with the experience of ATFM	Seminar	October 2008	COMPLETED ATFM Workshop conducted in Fukuoka, Japan from 7-9 October 2008
C 18/12 D	Assistance to States to improve AIS capability	That, in follow up to the comprehensive survey on AIS conducted in the Asia/Pacific Region in 2006/2007, ICAO undertake a special implementation project during the second half of 2008 for a workshop/seminar to be held on AIS automation	Establish SIP Conduct SIP	ICAO HQ Regional Office assisted by States	SIP approval SIP completed	 2009.	COMPLETED Council has approved -a Seminar, to be scheduled for late 2008 COMPLETED AIS Automation/ eTOD Seminar/ Workshop conducted in Japan, 23&24 Feb 09, followed by AAITF/4

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Concl/ Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 18/15 D	Strategies to implement eTOD	That, in light of the experiences encountered by States attempting to implement Annex 15 provisions on eTOD, ICAO be invited to:					
		a) hold an eTOD Workshop in the Asia and Pacific Region during 2008;	conduct workshop	ICAO APAC Office	SIP Approval Workshop	Feb 2009	COMPLETED AIS Automation/ eTOD Seminar/ Workshop conducted in Japan, 23 & 24 Feb 09, followed by AAITF/4.
		b) make available the <i>Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information</i> (Doc 9881), as soon as possible; and	circulate guidelines to states	ICAO APAC Office-HQ	HQ State letter	2010	CLOSED. ICAO HQ is finalizing Doc 9881, will transmit by State letter in due course.
		c) provide specific guidance on cost recovery and property rights of eTOD material	establish and provide guidelines	ICAO HQ	Specific guidelines		CLOSED. World Wide symposium conducted in June 08 addressed this issue.

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Concl/ Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 18/23 D	Discontinuation of Asia/Pacific Regional Plan for New CNS/ATM Systems	That a) in order to harmonize planning process with the Global Air Navigation Plan, Regional Plan for New CNS/ATM Systems be discontinued; and b) ICAO be invited to develop detailed proposals for incorporating the useful information contained in the Regional Plan for the CNS/ATM Systems into the Asia Pacific Regional Air Navigation Plan (Doc 9763) and completed by 2009.	Notify states Establish proposals	ICAO APAC Office ICAO APAC Office	State letter Proposal for the consideration at APANPIRG 20 in September 2009	Oct 2007 2009	COMPLETED. State Letter AP0112/07 (CNS) issued on 16 Oct. 07. ON GOING Task in b) to be undertaken in coordination with HQ.
C 18/53 D	Development of State PBN Implementation Plans	That, the Regional Office encourage States to begin development of their State PBN implementation plans in harmony with the development of the Asia/Pacific Regional PBN implementation plan being coordinated by the Asia/Pacific PBN Task Force for submission to APANPIRG/19 (2008).	Encourage States to develop State PBN implementation plan by 2009	ICAO APAC Office	State Letter based on regional PBN implementation plan to be developed by PBN task force	2009	ONGOING. PBN/TF is developing models for such plans.

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Concl/ Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 18/59 D	Resolution of ATM and OPS Deficiencies in the South West Pacific Small Island Developing States (SIDS)	That, in recognizing the safety implications of the long-standing ATM and OPS deficiencies in the South-West Pacific SIDS included in the APANPIRG Deficiency Data Base, ICAO, in coordination with the international organizations and regional bodies concerned, considers providing urgent assistance to these States in order to build their capacity to provide the required services in a sustainable and cost-efficient manner	Assist in establishment of TC project	ICAO HQ	TC Project	2008	ON GOING State letter to SIDS circulated on 22 January 08 to update the status of deficiencies identified. Additional follow up by Regional Office and through PASO. Response still awaited from States.

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Concl/ Dec No. --- Strategic Objective*	Title of Conclusion/ Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date	Status
C 15/15	Asia Pacific Regional ATN Implementation System Management Operational Procedures	That, the Asia/Pacific regional ATN Implementation System Management Operational Procedures be published to assist States in implementation of the ATN ground infrastructure in the Asia/Pacific region.			Considered premature due to lack of experience in operational aspect to develop a manual procedure. This task can be addressed only after gaining sufficient operational experience of AMHS. Asia/Pacific Regional ATN Implementation System Management Operational Procedures containing initial direction and guidance was published in August 2004.	2009	COMPLETED The basic guidance material on procedures was developed in 2004. Further updates are expected by ATNICG based on sufficient experience gained in 2009. Updated guidance material has been developed by the ATNICG/4 meeting for consideration by APANPIRG through CNS/MET SG.

* **Note:** ICAO has established the following Strategic Objectives for the period 2005-2010:

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A: Safety - Enhance global civil aviation safety; **B: Security** - Enhance global civil aviation security; **C: Environmental Protection** - Minimize the adverse effect of global civil aviation on the environment; **D: Efficiency** - Enhance the efficiency of aviation operations; **E: Continuity** - Maintain the continuity of aviation operations; **F: Rule of Law** - Strengthen law governing international civil aviation.

**AGENDA ITEM 2: GLOBAL AND INTER REGIONAL
ACTIVITIES**

Agenda Item 2: Global and Inter Regional Activities

2.1 Transition to Aeronautical Information Management

2.1.1 The meeting was apprised that the Air Navigation Commission reviewed a work programme to enable the global transition from aeronautical information services (AIS) to aeronautical information management (AIM). A number of issues relating to Annex 15 — *Aeronautical Information Services*, Annex 4 — *Aeronautical Charts* and associated guidance material were identified including the need for a global strategy/roadmap for the transition from AIS to AIM.

2.1.2 In terms of quality management system (QMS), the proposal for the amendment to Annex 15 clarifies the scope of the QMS to encompass all organizations involved in the data processing chain, from the point of origin/survey, through to the AIS and distribution of the data to the intended user and upgrades the provision of automated pre-flight information systems to a Standard. In order to foster the implementation of QMS, a manual on QMS is under development by the Secretariat with the assistance of the AIS-AIMSG. The proposal to upgrade Annex 15, paragraph 3.6.5 to a Standard requiring that States introduce automation enabling digital data exchange, in a progressive manner, has the objective of improving the speed, quality, efficiency and cost-effectiveness of AIS. The proposal will be supported by guidance material on an aeronautical conceptual and data exchange model for the development of databases and the establishment of data exchange services.

2.1.3 The proposal to amend Annex 15 also includes a recommendation to allow for the provision of an electronic aeronautical information publication (eAIP). The proposal specifies that when the eAIP is provided, the eAIP product remain equivalent and synchronized with the paper AIP product. The meeting recalled that the Amendment 33 to Annex 15 introduced requirements for States to provide electronic terrain and obstacle data (eTOD) over four areas. It became applicable in 2008 as far as the “entire territory of a State” and “Category II and III operations area” (i.e. Area 1 and Area 4, respectively) are concerned and would become applicable in 2010 as far as the “terminal control area” and “aerodrome/heliport area” (i.e. Area 2 and Area 3, respectively) are concerned. States have indicated that the requirements related to the “terminal control area” (Area 2) would be difficult and costly to implement and could therefore lead to a widespread non-compliance. To address this issue, the PIRGs including APANPIRG requested a review of SARPs and guidance material related to eTOD, Area 2 to determine if refinement of SARPs or development of additional guidance material was necessary. Due to expected implementation issues, it was agreed that the applicability date for Areas 2 and 3 be extended to 15 November 2012 (proposed Annex 15, paragraph 10.6.1.2 refers). As the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) is based on Annex 15 specifications for Area 2 and 3 electronic terrain and obstacle data, a consequential amendment is proposed to Annex 4, paragraph 5.2.1.

2.1.4 The meeting noted that the Commission deliberated on cost implication for these amendment proposals. The meeting was informed that a global strategy/roadmap for the transition from AIS to AIM has been developed, which is intended as a high-level document to provide a framework for States and PIRGs in their evolution towards AIM, and to clarify the purpose and scope of the transition. The roadmap identifies the major milestones towards a uniform global evolution to AIM and indicates specific steps and timelines for implementation. The editorial review of the “Roadmap for the transition from AIS to AIM” has been finalized and that the first edition of the document is presented at <http://www.icao.int/anb/AIM/>.

2.1.5 Concluding discussions on the amendments proposed by ANC to Annex 15, the meeting noted that subsequent to the replies to be received from States, the Air Navigation Commission will undertake a final review of the amendment proposal in its session in October – November 2009. Furthermore, the meeting called upon States to take into account these recent developments in the planning and implementation of AIM systems.

2.2 Asia and South Pacific Initiative to Reduce Emissions (ASPIRE)

2.2.1 The meeting noted the work of Asia and South Pacific Initiative to Reduce Emissions (ASPIRE). The ASPIRE Partnership, initiated in February 2008, has progressed significantly in the past year and a half. The initial ASPIRE partners, Airservices Australia, Airways New Zealand and the FAA have produced the ASPIRE Strategic Plan, executed a series of demonstration flights and initiated the development of shared performance metrics. In August, 2009 the ASPIRE partners published the first ASPIRE Annual Report. The partners are looking towards expansion of ASPIRE to additional providers and progressing activities identified in the ASPIRE Work Program through collaboration under the Informal South Pacific ATS-Coordinating Group (ISPACG) and other regional groups.

2.3 Vision of the Next Generation Air Transportation System

2.3.1 USA provided an update on the Next generation Air Transport System (NextGen). The NextGen vision for 2025 enables the safe, efficient and reliable movement of large numbers of people and goods throughout the air transportation system in a way that is consistent with national security objectives. NextGen is being developed as current demands on the United States of America's national air transportation system are exceeding its ability to provide sufficient system capacity domestically and abroad. In addition, operating and maintenance costs of the air traffic system are outpacing revenues, and the air carrier industry is experiencing a period of dramatic change. Finally, growth in air transportation is provoking community concerns over aircraft noise, pollution, and congestion. Merely adapting air transportation's current paradigm will not be sufficient to meet its challenges. Instead, transformation of today's system is required to ensure a healthy, environmentally friendly, globally interoperable air transportation system for 2025.

2.3.2 In the development of NextGen the United States is also taking a global perspective. The U.S. recognizes they can not build a viable harmonized system without partnerships with their domestic stakeholders and international counterparts. International harmonization accommodates both the demands of American users to operate globally without unnecessary constraint, and similarly, to embrace the needs of non-U.S. users to operate in the United States.

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**AGENDA ITEM 3: REGIONAL AIR NAVIGATION PLANNING
AND IMPLEMENTATION ISSUES**

Agenda Item 3.0: Regional and National Performance
Framework

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.0 Regional and National Performance Framework

A Performance Based Approach

3.0.1 The performance-based approach to planning stems from requirements associated with the results based environment that ICAO, industry and States have been steadily moving toward. The ICAO *Global ATM Operational Concept* (Doc 9854) provides a clear statement of the expectations of the Air Traffic Management (ATM) Community. Eleven of these expectations also referred to as key performance areas (KPAs), have been identified in the operational concept. To support this approach, the *Manual on Global Performance of the Air Navigation System* (Doc 9883) was developed. Doc 9883 provides a step by step approach to performance-based planning on the basis of the KPAs identified in the operational concept.

3.0.2 The ICAO planning objective is to achieve a performance based global air traffic management (ATM) system through the implementation of air navigation systems and procedures in a progressive, cost-effective and cooperative manner. The performance-based approach is structured upon the following primary principles:

- a) strong focus on desired/required results through adoption of performance objectives and targets;
- b) informed decision making, driven by the desired/required results; and
- c) reliance on facts and data for decision making.

3.0.3 Recognizing the benefits to be gained through the performance-based planning process including alignment of the work programmes of the States, regions and ICAO Headquarters, APANPIRG/19 had adopted the following Conclusion:

Conclusion 19 /1 — Regional performance framework

That, a regional performance framework be adopted on the basis of ICAO guidance material and aligned with the Global Air Navigation Plan and the Global ATM Operational Concept. The performance framework should include identification of regional performance objectives taking into consideration user expectations (to be mapped against current work) and completion of regional performance framework forms based on the sample shown in Appendix A to the report on Agenda Item 3.

3.0.4 APANPIRG/19 simultaneously adopted Conclusion 19/2 calling for States to adopt performance objectives on a national basis, in alignment with regional performance objectives.

3.0.5 The meeting learned that as a part of performance monitoring and measurement process ICAO intended to introduce, by 2010, a briefing on regional performance framework for air navigation systems at the very beginning of every PIRG meeting. In consultation with Regional Offices and PIRGs, a standardized format for this briefing is being developed and will be finalized soon.

ICAO support for development of Performance Frameworks

3.0.6 A five day workshop on the development of national performance frameworks to achieve a global ATM system was conducted within the framework of a Special Implementation Project (SIPs) from 9 to 13 March 2009 at the Regional Office, Bangkok. The objective was to provide States in the Asia/Pacific Regions with a better understanding of how to develop a national performance framework for the air navigation system, in support of APANPIRG Conclusions 19/1 and 19/2. The workshop was attended by a total of 58 participants from 18 States/Administrations and 1 international organization.

3.0.7 The workshop developed the following recommendations, to be addressed by ICAO and States as appropriate:

- 1) States collect and provide the required data to the regional office that meets the regional metrics to be developed by the APANPIRG for efficiency which includes capacity, cost effectiveness, GHG emissions and fuel burn.
- 2) States adopt a performance based approach in developing the air navigation infrastructure on the basis of ICAO guidance material and ensure their alignment with the regional performance objectives. The performance framework should include identification of national performance objectives and completion of national performance framework forms;
- 3) ICAO continues enhancing the ongoing intra and interregional coordination for planning, implementation and harmonization of a Global ATM system; and
- 4) ICAO assists States in the development of performance based planning for air navigation systems.

3.0.8 Recognizing the value of such a workshop and that States would continue to need assistance of this kind, the meeting adopted the following Conclusion:

Conclusion 20/1 – Performance Framework Workshop/Seminar

That, ICAO be invited to conduct additional Workshop(s)/Seminar(s) on performance frameworks to provide guidance to the States in developing their national performance frameworks.

Regional Performance Objectives and Performance Framework Forms

3.0.9 One of the key aspects of the performance based approach is the development of regional performance objectives with measurable outcomes and metrics. The following regional performance objectives in the ATM, AIS, SAR, CNS, MET, AOP and FS fields were developed in conjunction with supporting performance framework forms (PFFS, as elaborated in the appendix) based on the current regional work programme and supported by reviews in State meeting forums. The regional performance objectives also take into consideration the IATA user expectations.

- APAC Objective 1 – Airspace Safety Monitoring to achieve regional TLS
- APAC Objective 2 – Optimise Traffic Flow
- APAC Objective 3 – Optimise Route Structure in En-route Airspace

- APAC Objective 4 – Optimise Route Structure in Terminal Airspace
- APAC Objective 5 – Implementation of New ICAO Flight Plan Provisions
- APAC Objective 6 – Enhanced Provision of AIS/AIM
- APAC Objective 7 – Enhanced Search and Rescue Capability
- APAC Objective 8 – Implementation of ATN for Ground-Ground Communication Network
- APAC Objective 9 – Enhanced Communication and Surveillance in Oceanic Area
- APAC Objective 10 – Implementation of the ADS-B Air to Ground Surveillance
- APAC Objective 11 – Implementation of ATS Inter-Facility Data Communication (AIDC) in Asia/Pacific Region
- APAC Objective 12 – Implement International Airways Volcano Watch (IAVW), International Tropical Cyclone Watch (ITCW) and SIGMETs
- APAC Objective 13 – Implement WAFS and associated developments
- APAC Objective 14 – Develop regional MET requirements to support ATM
- APAC Objective 15 – Improve OPMET exchange efficiency
- APAC Objective 16 – Enhance safety and efficiency of aerodrome operations
- APAC Objective 17 – Improve contingency measures for aerodrome operations.
- APAC Objective 18 – Implementation of ICAO PBN provisions for terminal area operations

3.0.10 Following a review of the regional performance objectives and associated PFFs, the meeting agreed to the following Conclusion:

Conclusion 20/2 – Asia Pacific Regional Performance Objectives

That, the Asia Pacific Regional Performance Objectives and associated Performance Framework Forms (PFFs) as contained in **Appendix A** to the APANPIRG/20 Report on Agenda Item 3.0 be adopted.

3.0.11 The meeting agreed that wherever possible, States should use the regional performance objectives adopted above as the basis for development of their national performance objectives. This would ensure a complementary linkage between regional and national activities and accelerate implementation of the objectives. Encouraging States to use the template format from the regional objectives as the basis for their national objectives, the meeting adopted the following Conclusion:

Conclusion 20/3 – Align Regional & National Performance Objectives

That, the Regional Office encourages use by States of the PFF template adopted for the regional PFFs and circulate MS Word soft copy versions of the regional PFFs adopted by APANPIRG to enable States to derive national performance objectives based on the regional objectives.

Metrics supporting a Performance Based Approach

3.0.12 Assessment of performance achievements must be periodically checked through performance reviews, which in turn require adequate performance measurement and data collection capabilities. In order to ensure that appropriate data was available to enable the measurement of suitable regional metrics, the meeting agreed to the following Conclusion:

Conclusion 20/4 – Asia/Pacific Performance Metrics

That the following metrics be adopted as a part of Asia/Pacific regional performance monitoring and measurement:

APAC Metric 1	Percentage of RMA sub-regions achieving the regional Target Level of Safety (TLS) for RVSM operations, referenced as of April each year
APAC Metric 2	Percentage of instrument runway ends with an approach procedure with vertical guidance.
APAC Metric 3	Percentage of en-route and terminal PBN routes implemented on a sub-regional basis in accordance with the regional PBN plan
APAC Metric 4	Average delays for departures at State's primary international airports for the busiest hour on a weekly basis

Conclusion 20/5 – Data Collection for Regional Metrics

That States, organizations and stakeholders collect and process data to support the regional metrics adopted by APANPIRG, leveraging to the extent possible all existing data and ongoing efforts, and provide a progress report to APANPIRG/21.

3.0.13 To support the expeditious transition to the performance objectives and metrics, the meeting urged States to develop national performance objectives and complete national performance framework forms, and collect and provide the required data to the Regional Office to support the regional metrics.

Discontinue APANPIRG Key Priorities List

3.0.14 As part of the PFF drafting process, the ATM/AIS/SAR SG/19 and CNS/MET SG/13 meetings also reviewed the APANPIRG *List of Key Priorities for the CNS/ATM Implementation in the Asia/Pacific Region* and agreed that relevant matters from the List should be included in the regional performance objectives. The meeting agreed that as the ATM, CNS and MET related aspects of the Key Priorities List had been adequately incorporated into the PFFs the Key Priorities List would be discontinued, with immediate effect.

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		2009-2015	<u>Pacific Area</u> No APANPIRG regional working group established (Informal • South Pacific ATS Coordination Group – ISPACG, • Pacific ATS Coordinating Group – IPACG, and • East Asia ATM Coordination Group EATMG)	50 NM longitudinal implemented North Pacific in 2008 30/30 NM (RNP4) implemented Honiara, Nauru, Brisbane, Nadia Auckland Oceanic FIRs in January 2005 30/30 NM Operational trial Oakland FIR commenced 2007, Fukuoka FIR from August 2008, Anchorage FIR estimated 2011
AOM (Airspace Organization and Management)	Cross-Polar routes • Improve alignment and use of cross polar routes at their south (Asian) ends.	2010-2015	Special ATS coordination meeting – China, Mongolia, Russian Federation, IATA (CMRI) Informal Cross Polar Working Group (CPWG)	In progress
GPIs	GPI/5 Performance based navigation, GPI/8 Collaborative airspace design and management			
References	• <i>Asia/Pacific Regional Performance Based Navigation Implementation Plan</i> • <i>ICAO Performance Based Navigation Manual (Doc 9613)</i> • <i>Terms of Reference of the ATM Coordination Groups and Task Forces implementing PBN based route structures and reduced horizontal separation minima.</i>			

ASIA/PACIFIC REGION

**PERFORMANCE FRAMEWORK FORM
(REGIONAL)**

(amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 7</u>				
ENHANCED SEARCH AND RESCUE CAPABILITY				
Benefits				
Safety & Efficiency	• cost-efficient use of RCC accommodation and equipment on a shared basis, • development of a pool of experienced SAR mission coordinators skilled across both aviation and maritime domains thus reducing coordination and fragmentation, • proficient services provided near and within States with limited resources, • harmonization of aviation / maritime procedures, and • inter-operability of life-saving equipment			
Strategy Short to Medium term (2009 – 2015)				
ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
IM (Information Management)	Implementation of Annex 12 Standards and Recommended Practices and related APANPIRG Conclusions to ensure appropriate SAR capabilities for the Asia/Pacific regions.			
	• Periodic review of SAR facilities, services and procedures in the region;	2009-2015	States, ATM/AIS/SAR Sub Group	In progress
	• Encourage States to delegate or negotiate SAR services in accordance with Annex 12 provisions;	2009-2015	States, ATM/AIS/SAR Sub Group	In progress
	• APANPIRG Asia/Pacific “SAR Capability Matrix” and “Register of SAR Agreements” be kept up to date and distributed to States for information and action;	2009 - 2015	States, ATM/AIS/SAR Sub Group	In progress
	• States designate an agency for registering ELT Beacons, coded with the country code of the State and unique code of that beacon in a database as required by Annex 10.	2010	States	In progress
GPIs	None applicable			
References	• Annex 12 – Search and Rescue • International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual, Doc 9731) • APANPIRG Conclusions 18/19, 18/20, 20/17 and 20/18			

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	Implementation of AMHS Directory Service. Availability of AMC Software considered essential for the efficient management of AMHS Addresses. ICAO HQ requested to facilitate transfer of AMC Software from Eurocontrol to meet the requirements of Asia and Pacific Region.	2010	ICAO Asia/Pacific Office, ICAO HQ and Aerothai.	Being coordinated between ICAO Asia/Pacific Office, ICAO HQ and Aerothai
	States hosting Backbone Boundary Intermediate System hubs to implement dual stack ATN (ATN over OSI and ATN over IPS). APANPIRG, through Conclusion 19/20 urges States to complete the implementation of dual stack ATN by 2011	2011	Asia and Pacific Region States hosting Backbone Boundary Intermediate Systems	States hosting BBIS hubs have been reminded of APANPIRG Conclusion 19/20 and urged to complete the installation by 2011
	Completion of Networking with the BIS States	2012	Asia and Pacific Regions States	Some States started implementation and conducted operational trials
	Review if implementation objectives have been met.	2009 – 2012	ATNICG	ATNICG to periodically review the status and direction in which the implementation is progressing and to ensure that the implementation efforts are leading towards the defined objectives
GPIs	GPI/17: Data link applications; GPI/22: Communication infrastructure			
References	<i>Annex 10, Aeronautical Telecommunications, Volume III (Part I – Digital Data Communication Systems)</i> <i>Manual on Detailed Technical Specifications for the Aeronautical Telecommunications Network (ATN) using ISO/OSI (Doc 9880)</i> <i>ICAO Aeronautical Telecommunication Network (ATN) Manual for ATN using IPS Standards and Protocols (Doc 9896)</i> <i>Manual on Required Communication Performance (Doc 9869)</i> <i>Comprehensive Aeronautical Telecommunication Network (ATN) Manual (Doc 9739)</i> <i>Manual of Technical Provisions for the Aeronautical Telecommunication Network (Doc 9705)</i> <i>Regional Implementation guidance materials adopted by APANPIRG</i>			

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	provide summary information on non conformities in current satellite data link performance to all affected parties in the end-to-end communications chain.	2009	Satellite Operational Continuity Meeting (SOCM) April 2009 to summarize and circulate information to affected parties, including CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	
	develop a regional strategy and work programme to identify/design suitable long term mitigations and solutions to non conformities that will enable continuous operational compliance with specifications for RNP4 and RCP 240.	2010	Regional ANSPs, operators, FITS, CRAs, CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	Consider convening SOCM/2 to progress this work
	Develop a sample service level agreement for possible use by ANSPs	2010	Regional ANSPs, operators, FITS, CRAs, CSP	
	Implement mitigations and solutions in accordance with timelines in regional strategy	2010	Regional ANSPs, operators, FITS, CRAs, CSP, Ground Earth Station (GES) providers, equipment suppliers and satellite service providers.	
	monitor implementation progress	2010	Regional FITS, CRAs provide feedback to all affected parties	Consider convening SOCM/3 to finalize this work
GPIs	GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;			
References	<i>Manual on Required Communication Performance (Doc 9869)</i> <i>RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (the "Oceanic SPR")</i> <i>FANS-1/A Operations Manual (FOM)</i> <i>Global Operational Data Link Document (GOLD)</i> <i>Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region</i> <i>CEANS Report(2008) on ANS Infrastructure</i> <i>APANPIRG Conclusion 19/24, 20/31, 20/32/20/33, 20/34 and 20/73</i>			

ASIA/PACIFIC REGION

**PERFORMANCE FRAMEWORK FORM
(REGIONAL)**

(amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 10</u>					
IMPROVED SITUATIONAL AWARENESS AND SURFACE SURVEILLANCE- IMPLEMENTATION OF THE ADS-B TO GROUND SURVEILLANCE					
Benefits					
Environment	• Reductions in fuel consumption and subsequent lower gas emissions				
Efficiency	• Increased flexibility and flow of traffic operations • Ultimately, when performing <i>radar-like</i> control, potential redesign of airspace taking into account the application of reduced separation minima, integrate use of aircraft navigation and surveillance capability				
Safety	• Introduction of surveillance in a non-radar environment • Support to search and rescue operations				
Strategy Medium Term (2011-2015) Short term (2010)					
ATM OC COMPONENTS	TASKS	TIME FRAME STARTED	RESPONSIBILITY	STATUS	REMARKS
AOM (Airspace Organisation and Management) CM (Conflict Management) AUO (Airspace Users Operations)	Implementation of ADS-B based surveillance service in the sub-regions.				
ATM SDM (ATM Service Delivery Management)	• Compare current technologies with respect to concept of operations, relative costing, technical and operational performance and maturity of alternative technology/solutions (primary, secondary radar including Mode-S, ADS-B, multilateration, ADS-C)	2009	ADS-B Study and Implementation Task Force (ADS-B SITF)	In progress	Regional Guidance material on comparison of technologies issued

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	• Develop an implementation plan for near term ADS-B applications in the Asia Pacific Region including implementation target dates taking into account: - o available equipment standards; readiness of airspace users and ATS providers; - o identifying sub-regional areas (FIRs) where there is a positive cost/benefit outcome expected for near-term implementation of ADS-B OUT; - o developing a standardized and systematic task-list approach to ADS-B OUT implementation; and - o holding educational seminars and provide guidance material to educate States and airspace users on what is required to implement ADS-B OUT	2009-10	ADS-B Study and Implementation Task Force	In progress	The FASID Table CNS 4A and 4B – surveillance and ATM automation being updated; ADS-B Seminar conducted annually; potential sub-regions for using ADS-B identified; Requirement for avionics specification for the near term application are being developed based on AMC2024 and Australian CASA document.

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	• Develop Guidance Material to support harmonized regulation of ADS-B systems required on board the aircraft.	2010	ADS-B Study and Implementation Task Force	To be started	Forty Fifth DGCA Conference, through its Action Item 45/3 invited ICAO APANPIRG ADS-B Study and Implementation Task Force (ADS-B SITF) to develop the guidance material.
	• Study and identify applicable multilateration applications in the Asia and Pacific Region considering: - Concept of use/operations; - Required site and network architecture; - Expected surveillance coverage; - Cost of system; - Recommended separation minimas; and - If multilateration can be successfully integrated into an ADS-B OUT system for air traffic control	2011	ADS-B Study and Implementation Task Force	In progress	Concept of using multilateration has been developed; Some states have plan in place to introduce multilateration in particular & integrate it with A-SMGCS and Terminal area and en-route surveillance application

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	• Coordinate ADS-B implementation plan and concept of operations with other ICAO regions where ADS-B implementation is going on and with relevant external bodies such as EUROCONTROL, EUROCAE, RTCA and Industry.	2013	ADS-B Study and Implementation Task Force	In progress	Updated information on ADS-B in Europe and North American Regions is provided to Task Force Meeting annually; Some Industry representatives provide input at ADS-B Seminar and meetings
	• Develop Terms of Co-operation for SEA which will include: • Establishing model documents for possible use by States when - Agreeing to share ADS-B data and DCPC (such as VHF radio voice communication) capability between adjoining States for various ADS-B applications (including a sample letter of agreement); or - Establishing ADS-B avionics fitment mandates • Identifying optimum coverage for ADS-B ground stations and associated VHF radio voice communication in the sub-regional FIR boundary areas.	2011	South East Asia (SEA) Sub-Regional ADS-B Implementation Working Group	In progress	Terms of co-operation developed; sample agreement of data sharing developed; Some location for ADS-B ground stations identified. CBA for SEA project being progressed; Implementation plan being developed.

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	Develop an implementation plan for near term ADS-B application in SEA which will deliver efficient airspace and increased safety on a regional basis that includes: • Schedule and priority dates to bring into effect ADS-B based services taking into account: - Timing of any equipage mandates; - Timing of any ATC automation upgrades to support ADS-B; - Timing of commissioning of any ADS-B data sharing and associated VHF radio voice communication facilities • Consideration of major traffic flows:				Major traffic flow from Australia to Singapore through Indonesia and L642 and M771 in SEA being considered
linkage to GPIs	GSI-12 Use of Technology to Enhance Safety; GPI/9 Situational Awareness; GPI/5: RNAV and RNP, GPI/7: dynamic and flexible ATS route management, GPI/17: data link applications and GPI/22: Communication Infrastructure;				
References	• <i>Report of AN CONF/11;</i> • <i>Global ATM Operational Concept (Doc9854);</i> • <i>Global Air Navigation Plan (Doc9750);</i> • <i>Technical Provisions for Mode S Services and Extended Squitter (Deco9871)</i> • <i>APANPIRG/16/17/19/20 report on ADS-B</i> • <i>ADS-B related regional guidance materials adopted by APANPIRG</i>				

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	Review implementation issues related to ATS automation systems and recommend methods of mitigating those issues	2009	ADS-B SITF CNS/MET SG	The automation issues to be discussed in the ADS-B SIFT/8
	AIDC Seminar: A Seminar to be conducted to discuss various implementation issues and promote implementation	2009	ICAO Asia/Pacific Office	Seminar to be conducted
	Develop implementation strategy to decide whether to continue pursuing AFTN AIDC or to choose ATN AIDC over OSI or IPS	2010	APANPIRG	ATN AIDC is currently not in use.
	Trials to be conducted. Monitoring mechanism to be developed	2011	APANPIRG	State Letter be issued urging the States to expedite implementation and status to be monitored.
	Review to ensure implementation objectives are met.	2009 - 2015	APANPIRG	APANPIRG to periodically review the status and direction in which the implementation is progressing and to ensure that the implementation efforts are leading towards the defined objectives
GPIs	GPI/17: Data link applications, GPI/22: Communication infrastructure			
References	<i>Air Traffic Management</i> (Doc 4444) <i>Manual of Air Traffic Services Data Link Applications</i> (Doc 9694) <i>Manual of Technical Provisions for the Aeronautical Telecommunication Network</i> (Doc 9705) <i>Asia/Pacific Regional Interface Control Document (ICD) for ATS Interfacility Data Communication (AIDC)</i>			

ASIA/PACIFIC REGION

**PERFORMANCE FRAMEWORK FORM
(REGIONAL)**

(amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 15</u>				
IMPROVE OPMET EXCHANGE EFFICIENCY				
Benefits				
Safety Efficiency	• Increase OPMET availability and reliability needed for flight planning (efficiency) and in-flight re-planning (safety)			
Strategy				
Short term/Medium term (2011 - 2015)				
ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
MET	• Improve the availability of OPMET data at the Regional OPMET Data Banks (RODB)	2009 - 2015	OPMET/M TF	In progress
	• Improve the inter-regional OPMET exchange	2009 - 2015	OPMET/M TF	In progress
	• Improve the availability of OPMET data in the Pacific	2009 - 2015	OPMET/M TF &TCB & PASO & States	In progress
	• Review and update regional ROBEX tables and guidance material	2009 - 2015	OPMET/M TF & RO	In progress
	• Facilitate and monitor the migration to AIM and new MET codes (e.g. XML) for METAR/SPECI, TAF and SIGMET	TBD	OPMET/M TF & RO	TBD
Linkage to GPIs	GPI/19 – Meteorological Systems (Note: if sufficient assessment information is available at the OPMET/M TF/7 meeting, use as baseline and provide a target level of improvement in the first 3 bullets)			
References	• SADIS User Guide • ROBEX Handbook • Asia/Pacific OPMET Data Banks Interface Control Document			

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**PERFORMANCE FRAMEWORK FORM
(REGIONAL)**

(amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 16</u>				
ENHANCE SAFETY AND EFFICIENCY OF AERODROME OPERATIONS				
Benefits				
Safety	• Ensure continued safety, regularity and efficiency of aircraft operations at aerodromes • Ensure the aerodromes are in compliance with the relevant ICAO SARPS and Civil Aviation Regulations. • Prevention of accidents • Reduction/elimination of deficiencies • Uniform conditions for aircraft of all other contracting states			
Efficiency	• improved aerodrome capacity			
Strategy Short term (2009-2012)/medium term (2009-2015)				
ATM OC COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
AO (Aerodrome operations), CM (conflict management), TS (Traffic synchronization), AUO (Airspace user operations)	<u>AERODROME CERTIFICATION</u>			
	• Facilitate the implementation of Aerodrome Certification by conduct of courses and seminars.	2009 , 2010, 2011 & 2012	ICAO APAC Office	Aerodrome certification course conducted from 29 June to 2 July 2009. Aerodrome seminar is planned in November 2009
	• Establish a regulatory framework specifying the criteria for the certification of aerodromes.	2009-2011	State	
	• Establish a regulatory authority [CAA]	2009-2012	State	Based on the results of the survey conducted in the region during 2006-2008, 30 States have confirmed the existence of a basic aviation law that provides for the establishment of the civil aviation authority, a key
	• Develop and approve aerodrome certification regulations and standards	2009-2012	State	
	• Develop, issue and maintain guidance material and Advisory circulars on aerodrome certification for service providers.	2009-2012	State	
• Establish an entity within CAA responsible for aerodrome safety oversight and staffing requirements. Develop Manual of	2009-2012	State		

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	Aerodrome oversight procedures and Aerodrome Inspector Handbook			requirement for undertaking the process of aerodrome certification. Aerodrome certification regulations have been promulgated in 28 States, including 1 Territory (French Polynesia) and one Administration (Hong Kong). 100 out of 193 international airports listed in Air Navigation Plan have been stated to be certified. SMS regulations have been promulgated in 16 States, including one Territory and one Administration. 57 airports have stated that an SMS is in place at the certified aerodrome. APANPIRG to urge states who have not yet implemented the ANNEX 14 requirements on Aerodrome certification to allocate high priority and resources in the implementation The ICAO Regional office initiated a survey on establishment of national bird
	<u>SMS AT CERTIFIED AERODROMES</u>			
	Facilitate the implementation of SMS by the conduct of courses	2010, 2013	ICAO	
	Develop SMS regulations & guidance material for the implementation of SMS, staff training, enforcement policy and communication means;	2009-2014	State	
	Develop and establish the action plan on safety targets, hazard reporting, staff training, safety oversight, guidance material and accepted level of safety	2009-2015	State	
	<u>WILDLIFE HAZARD CONTROL AND REDUCTION</u>			
	Survey to collect information on state's practices with respect to airport wildlife control	2010	ICAO APAC Office	
	Establishment of a national procedure for recording and reporting wildlife strikes to aircraft;	2010 -2012	State	
	Establishment of a national bird control committee	2009-2012	State	
	Conduct wildlife assessments and Implement wildlife control programmes. Airports develop and professionally implement management plan to reduce the risk of strikes.	2009-2012	State	
	Land use management inside and in the vicinity of airport	2010 - 2015	State	
	States collect wildlife strike reports and forward to ICAO for inclusion in the ICAO IBIS (data base).	2009-2012	State	
	Seminar on wildlife assessment /reduction	2011	ICAO APAC Office	

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	- Wildlife hazard management training for airport personnel <u>AERODROME SAFETY MEASURES</u> - Monitoring the height of buildings or structures within the boundaries of OLS; - Measurement and reporting of friction characteristics of wet paved runways - procurement of a friction measuring device - establishment of maintenance friction level below which corrective action should be initiated; and - establishment of minimum friction level below which information that a runway may be slippery when wet is made available. - Provision of runway end safety area; - Provision of enhanced visual aids and markings to help prevent runway incursions - Seminar on runway surface friction measurement	Continuous basis 2009-2015 2011 2011 2011 2011 2014 2014 2011	State State State State State State State ICAO	control committee in 2008. The survey reveals that: 15 States including one Administration have informed that a National Bird control committee has been established with defined terms of reference and 2 States have mentioned that the process of establishing a National Bird control Committee is ongoing. Next Survey planned in 2010.
Linkage to GPIs	GPI/13 Aerodrome Design and Management and GPI/14 Runway operations			
References	<i>Annex 14, Volume I</i> <i>Doc 9774 – Manual on certification of Aerodromes</i> <i>Doc 9859 – Safety Management Manual</i> <i>Doc 7300 – convention on International civil Aviation</i> <i>Doc 9137 – Airport Services Manual, Part 3, bird control and reduction;</i> <i>Doc 9332 – Manual on the ICAO Bird Strike information System (IBIS)</i> <i>Doc 9184 – Airport Planning Manual Part 2, Land Use and Environmental Control.</i> <i>Doc 9157 – Aerodrome Design Manual, Part 1, Runways</i> <i>Doc 9157 – Aerodrome Design Manual, Part 3, Pavements</i> <i>Doc 9157 – Aerodrome Design Manual, Part 4, Visual Aids</i> <i>Doc 9137 – Airport Services Manual, Part 2, Pavement surface Conditions</i> <i>Doc 9137 – Airport Services Manual, Part 6, Control of Obstacles</i> <i>Doc 9137 – Airport Services Manual, Part 8, Airport Operational Services</i> <i>Doc 9137 – Airport Services Manual, Part 9, Airport Maintenance Practices</i>			

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Linkage to GPIs	GPI/13 Aerodrome Design and Management and GPI/14 Runway operations
References	• <i>Annex 14, Volume I</i> • <i>Doc 9137 – Airport Services Manual, Airport emergency Planning, Part 7</i>

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM
(REGIONAL)

(amended 11 September 2009)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 18</u>	
IMPLEMENTATION OF ICAO PERFORMANCE BASED NAVIGATION PROVISIONS FOR TERMINAL AREA OPERATIONS	
Implement ICAO Performance Based Navigation (PBN) provisions for terminal area operations in collaboration with stakeholders based on the Regional PBN Implementation Plan agreed by APANPIRG, to improve terminal area safety and efficiency by use of advanced navigation specifications for SIDs, STARs and instrument approach procedures.	
Benefits	
Environment	• reduction in fuel consumption and resulting emissions
Safety	• enhance safety by use of modern capabilities onboard aircraft; • implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows; • increased airspace safety through the implementation of continuous and stabilized descent procedure using vertical guidance; • improved airport and airspace arrival paths in all weather conditions; and • decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the need for ATC-pilot communication and radar vectoring
Efficiency	• allows for more efficient use of airspace and increase airspace capacity through reduction of lateral and longitudinal separation between aircraft; • increase of predictability of the flight path; • reduced delays in high density airspace and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas; • ability of air navigation service providers to make maximum use of aircraft capabilities; • ability of aircraft to conduct flights more closely to their preferred trajectories; • Reduced aircraft flight time due to the implementation of optimal flight paths; • facilitate utilization of advanced technologies thereby increasing efficiency; • optimized demand and capacity balancing through the efficient exchange of information; • reduces the need to maintain sensor-specific route and procedures, and their associated costs; • avoids the need for developing sensor-specific operations with each new evolution of navigation system, which would be cost prohibitive; • clarifies how RNAV systems are used; and • facilitate the operational approval process for operators by providing a limited set of navigation specifications intended for global use.

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SAFETY COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
<u>APANPIRG Conclusion 18/52</u>	Establishment of a Regional Performance Based Navigation Task Force (PBN/TF) An Asia/Pacific PBN Task Force, with terms of reference as outlined in Appendix A to the APANPIRG/18 Report on Agenda Item 3.5, be established to develop a PBN implementation plan for the Asia/Pacific Region and address related regional PBN implementation issues.	PBN TF – As soon as practicable Regional PBN Implementation Plan – by 2008 (Before APANPIRG-19)	APANPIRG PBN Task Force	Regional Performance Based Navigation Task Force (PBN/TF) established Meetings of PBN T/F held as per following schedule 1st 9–11 Jan 2008 2nd 1 – 3 April 2008 3rd 14-17 July 2008 4th 4-6 March 2009 5th 15-17 July 2009 APANPIRG/19 approved the Regional PBN Implementation Plan Interim Edition RASMAG reviewed the Plan in Dec 2008 suggested some changes PBN/TF 4 reviewed RASMAG proposals and incorporated comments in the Version 0.2 of the Plan Plan was further reviewed by: ATM/AIS/SAR/SG/19 ; and CNS/MET/SG /13 Version 0.3 of the Plan being put up to APANPIRG/20

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APANPIRG Conclusion 18/53	Development of State PBN Implementation Plans The Regional Office should encourage States to begin development of their State PBN implementation plans in harmony with the development of the Asia/Pacific Regional PBN implementation plan being coordinated by the Asia/Pacific PBN Task Force for submission to APANPIRG/19 (2008).	State PBN Implementation Plan - 2009	STATES PBN TF APAC Office	Under development
APANPIRG Conclusion 18/55	Designation of Contact Person for PBN Implementation States designate a focal contact person responsible for performance based navigation implementation and provide details of the contact person to ICAO Asia/Pacific Regional Office accordingly.	31 December 2007	STATES APAC Office	26 States and 3 Int'l Organizations have nominated Focal Points Reminders being regularly sent to States to nominate Focal Points
PBN/TF Report	Develop detailed Status (database) regarding current and planned implementation of PBN terminal instrument procedures (SIDs and STARs) and Approaches			ONLY 8 States have provided information Reminders are being sent regularly
	Data Collection – Runway ends /International Aerodromes	30 June 2008	STATE Focal Point	
	Data Collection – Runway ends /Domestic Aerodromes	31 December 2008	STATE Focal Point	
PBN Report	Template developed by PBN TF for reporting progress: - Common Template will help in harmonizing the reporting process; - States requested to submit PBN Implementation Progress Report by 15 August 2009 for submission to APANPIRG 20.	15 August 2009 and prior to each future PBN/TF Meeting	STATE	7 States have submitted PBN Implementation Progress on the new Template.

Strategy Short term (2008 – 2012)				
TMA–Arrival TMA-Departure Approach	1. RNAV 1 in radar environment and with adequate navigation infrastructure. 2. Basic-RNP 1 in non-radar environment	RNAV 1 STAR for 50% of international airports by 2010 and 75% by 2012. Priority should be given to airports with RNP Approach	STATES APANPIRG PBN TF	
	1. RNAV 1 in radar environment and with adequate navigation infrastructure. 2. Basic-RNP 1 in non-radar environment	RNAV 1 SID for 50% of international airports by 2010 and 75% by 2012. Priority should be given to airports with RNP Approach	STATES APANPIRG PBN TF	
	1. RNP APCH with Baro-VNAV in most possible airports 2. RNP AR APCH in airport where there are obvious operational benefits.	RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012. Priority should be given to airports with operational benefits	STATES APANPIRG PBN TF	

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Strategy Medium Term (2013 – 2016)				
SAFETY COMPONENTS	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
TMA–Arrival	1. Expand RNAV 1 or RNP 1 Application 2. Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	RNAV 1 or RNP 1 STAR for 100% of international airports by 2016 RNAV 1 or RNP 1 STAR for 70% of busy domestic airports where there are operational benefits	STATES PBN TF APANPIRG	
TMA-Departure	1. Expand RNAV 1 or RNP 1 Application 2. Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	RNAV 1 or RNP 1 SID for 100% of international airports by 2016 RNAV 1 or RNP 1 SID for 70% of busy domestic airports where there are operational benefits	STATES PBN TF APANPIRG	
Approach	1. Expansion of RNP APCH (with Baro-VNAV) and APV 2. Expansion of RNP AR APCH where there are operational benefits 3. Introduction of landing capability using GNSS and its augmentations	RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016	STATES APANPIRG PBN TF	

Strategy Long Term (2016 and beyond)	
In this phase, GNSS is expected to be a primary navigation infrastructure for PBN implementation. States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on GNSS implementation and operation. During this phase, States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance. With the expectation that precision approach capability using GNSS and its augmentation systems will become available, States are encouraged to explore the use of such capability where there are operational and financial benefits.	
GPIs	GPI/5: Performance based navigation, GPI/9: Situational awareness, GPI/11: RNP and RNAV SIDs & STARs,
References	• <i>ICAO Asia Pacific Regional Performance-Based navigation Implementation Plan - Version 2</i> • <i>APANPIRG 18 Decision - ; APANPIRG 19 Decision -</i> • <i>ICAO Guidance Material – Performance-Based Navigation Manual Doc 9613 AN/937 Third Edition – 2008</i> • <i>Assembly Resolution 36-23</i>

Agenda Item 3.1: AOP

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.1 Aerodrome Operations and Planning (AOP)

3.1.1 Report on the Annex 14, Volume I Requirements on Runway Surface Friction Characteristics

3.1.2 The meeting recognized the importance of evaluating runway surface condition when first constructed or after resurfacing to determine the wet runway surface friction characteristics.

3.1.3 The meeting noted from the ICAO survey on the States practices concerning runway surface friction characteristics that:

- 14 States including 2 Administrations require a description of the runway surface condition be made available whenever water is present on the runway and information that a runway or portion thereof may become slippery when wet be made available; one State has informed that that there are plans to establish such a requirement;
- 12 States including 2 Administrations determine that a runway or portion thereof is slippery when wet when the friction characteristics of a runway surface measured with a continuous friction measuring device show that the measurements are below the minimum friction level;
- 12 States and 2 Administrations make available information on the minimum friction level for reporting slippery runway conditions and the type of friction measuring device used to arriving and departing aircraft; one State has reported that they are examining this requirement and two States have reported that the requirement will be established;
- 4 States and 2 Administrations promulgate the information on the minimum friction level for reporting slippery runway conditions in their national AIP; 5 States have reported that they have plans to establish the requirement and one State has reported this is being examined;
- 11 States and 2 Administrations require additional measurements to be carried out when it is suspected that a runway may become slippery under unusual conditions and promulgate information on the runway surface friction characteristics when these additional measurements show that the runway or portion thereof has become slippery; Two States have reported that they have plans to establish such a requirement;
- 6 States require an assessment of the condition of the runway and measurement of the friction coefficient whenever a runway is affected by snow, slush, or ice and it has not been possible to clear the precipitant fully;
- 5 States require an assessment of the mean depth of dry snow, wet snow or slush to be carried out; and
- One State has commented that friction testing requirements are difficult for aerodromes in the country due to the cost of the equipment and low traffic volumes. ICAO needs to provide more practical guidance and information on friction testing and runway surface assessment for aerodrome operators where equipment is not available. Also, using a set friction level does not take into account the different types of runway surfaces, traffic volumes and operating environments.

3.1.4 The meeting urged States who have not responded to the survey to complete the survey questionnaire and submit to ICAO Regional office. The meeting also urged States to:

- i) establish criteria for the friction characteristics for new or resurfaced runway surfaces;
- ii) make available information on the minimum friction level for reporting slippery runway conditions and promulgation of this information in their national AIP; when the friction of a runway is found to be below this reported value such information promulgated by NOTAM;
- iii) establish a maintenance friction level below which appropriate corrective action should be initiated to improve friction; and
- iv) provide the date/dates by which their Administration will have complied with the provision of Annex 14, Volume I requirements.

Amendment 10 to Annex 14, Volume I- *Aerodrome Design and Operations*

3.1.5 The meeting noted that Amendment 10 to Annex 14, Volume I has become effective from 20 July 2009 and will become applicable on 19 November 2009. The meeting urged States to review the amendments published as attachments to ICAO State letter AN 4/1.2.23-09/30 dated 9 April 2009 on the ICAO NET (www.icao.int/icaonet) and

- i) notify ICAO before 19 October 2009 any differences that will exist on 19 November 2009 between the national regulations or practices and the provisions of the whole of Annex 14, Volume I as amended by all amendments up to and including Amendment 10 and thereafter of any further differences that may arise; and
- ii) to provide the date or dates by which their Administration will have complied with the provisions of the whole of Annex 14, Volume I, as amended by all amendments up to and including Amendment 10.

Amendment 4 to Annex 14, Volume II- *Heliports*

3.1.6 The meeting noted that Amendment 4 to Annex 14, Volume II has become effective from 20 July 2009 and will become applicable on 19 November 2009. The meeting urged States to review the amendments published as attachments to ICAO State letter AN 4/16.6-09/31 dated 9 April 2009 on the ICAO NET (www.icao.int/icaonet) and :

- i) notify ICAO before 19 October 2009 any differences that will exist on 19 November 2009 between the national regulations or practices and the provisions of the whole of Annex 14, Volume II as amended by all amendments up to and including Amendment 4 and thereafter of any further differences that may arise; and
- ii) to provide the date or dates by which their Administration will have complied with the provisions of the whole of Annex 14, Volume II, as amended by all amendments up to and including Amendment 4.

Status of Implementation of Annex 14, Volume I requirements on Aerodrome Certification and Bird control committee

3.1.7 The meeting recognized the importance of aerodrome certification and took note of the Assembly Resolution A 36-13, Appendix P. The meeting expressed appreciation for the three COSCAPs in conducting the aerodrome certification course from 20 June to 2 July 2009 in Bangkok which was well attended by 60 participants from 15 states.

3.1.8 The meeting noted that 26 States and two Administrations have reported the existence of a basic aviation law that provides for the establishment of the civil aviation authority, a key requirement for undertaking the process of aerodrome certification. Aerodrome certification regulations have been promulgated in 23 States, including 1 Territory (French Polynesia) and one Administration (Hong Kong). 101 out of 193 international airports listed in Air Navigation Plan have been reported certified. SMS regulations have been promulgated in 14 States, including one Territory and one Administration. 59 airports listed in the Asia Pacific Air Navigation Plan have an SMS in place.

3.1.9 The meeting expressed appreciation for the Civil Aviation Authority of Hong Kong's gesture to organize a seminar from 3 to 5 November 2009 and urged States to provide a speaker to share their country experience and nominate participants.

3.1.10 The meeting recalled APANPIRG Conclusion 18/1 on the establishment by States a national bird control committee to study analyze and adopt measures to prevent bird hazards in its aerodromes and their vicinity, and monitor the implementation of the bird control programme by the aerodrome operator. The meeting noted that 17 states including one Administration have reported that a national Bird control Committee has been established with a defined Terms of Reference.

3.1.11 The meeting urged States who are yet to implement aerodrome certification and SMS to allocate high priority and adequate resources and to establish a National Bird Control committee in accordance with Conclusion 18/1 and report to the ICAO Regional Office.

3.1.12 The meeting noted that ICAO Regional Office will conduct a seminar on bird strikes management and control tentatively scheduled in 2010.

ANSPs partnership against the spread of influenza and other dangerous communicable diseases

3.1.13 The United States presented an information paper with regards to the role of Air Navigation Service Providers (ANSPs) partnership against the spread of influenza and other dangerous communicable diseases. The meeting was reminded that Amendment 20 to ICAO Annex 9, Facilitation, calls for the pilot-in-command (PIC) to promptly notify ATC of suspected cases on board. Procedures that utilize this information received by ATC are dealt with through an interagency Concept of Operations (CONOPS) which involves the FAA, Transport Security Administration (TSA), the Centers for Disease Control and Prevention (CDC), Customs and Border Protection (CBP) and others. A common CONOPS was established by the US, Canada and Mexico under the guise of the North American Aviation Trilateral (NAAT) to coordinate aviation operational responses to suspected in-flight cases of pandemic influenza and other communicable diseases that includes communication procedures amongst these States, identified public health stations, the development of ATM protocols and planned operational exercises by the end of 2009. IATA reiterated the need for ICAO to facilitate in the coordination between the Public Health Authority and the aviation sector. IFALPA recommended a direct line of communication to one common centre that can provide guidance to the cabin crew in assessing the current situation and provide an appropriate response. The

Secretariat suggested the information paper be forwarded to the ICAO ANB/TCB CASPSA (Cooperative Arrangement for the Prevention of Spread of Communicable Disease through Air Travel) for information and consideration.

Agenda Item 3.2: ATM/AIS/SAR

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.2 ATM/AIS/SAR

3.2.1 The meeting was updated on the activities of the ICAO and State ATS coordination groups that contribute to the ATM/AIS/SAR work of APANPIRG.

3.2.2 The meeting reviewed the outcomes of the 19th meeting of the Air Traffic Management/Aeronautical Information Services/Search and Rescue Sub-Group (ATM/AIS/SAR/SG/19, June 2009) held at the ICAO Regional Office in Bangkok, Thailand. A copy of the full report of the meeting (347 pages including appendices) is available on the web site of the ICAO Asia/Pacific Regional Office at <http://www.bangkok.icao.int/> under the “Meetings” menu.

Review of Outstanding Conclusions and Decisions of APANPIRG

3.2.3 The ATM/AIS/SAR/SG/19 meeting reviewed and updated the list of outstanding Conclusions and Decisions of APANPIRG meetings prior to APANPIRG/19 with respect to ATM/AIS/SAR issues. The ATM/AIS/SAR/SG/19 meeting also reviewed and updated the list of the Conclusions and Decisions from APANPIRG/19 with respect to ATM/AIS/SAR issues. In particular, the Secretariat highlighted Decision 19/57 which had adopted amendments to the Terms of Reference (TOR) of the Sub Group to enable consideration of the Global Aviation Safety Plan (GASP) in planning processes, and ensure environmental initiatives are identified and progressed.

Air Traffic Management

Review of RVSM Task Force Meeting

3.2.4 The ATM/AIS/SAR/SG/19 meeting noted that the 34th meeting of the RVSM Implementation Task Force (RVSM/TF/34, December 2008) was held with the objective of conducting the one year post-implementation review of China RVSM. With the successful conclusion of the implementation of RVSM in China, it was agreed that the RVSM Task Force had carried out the TOR assigned to it by APANPIRG and the Task Force was dissolved at the end of RVSM/TF/34 in accordance with APANPIRG Conclusion 19/5.

3.2.5 The meeting noted that metric RVSM would be implemented in the Pyongyang FIR of the Democratic People’s Republic of Korea (DPRK) in late October, as described in paragraphs 3.3.23 to 3.3.27.

Western Pacific/South China RVSM Scrutiny Group

3.2.6 The Sixth meeting of the Western Pacific/South China Sea RVSM Scrutiny Group (WPAC/SCS RSG/6, April 2009) noted that large height deviation (LHD) occurrences were reducing in frequency and duration leading to the vertical TLS being satisfied. This positive trend in the risk assessment was attributed directly to the interventions made by States in identifying, and treating the numbers and duration of LHDs. However that the relatively high numbers of LHDs attributable to errors in ATC Unit-to-ATC Unit coordination were still driving the risk estimate and needed to be corrected.

3.2.7 In overall terms, it was apparent that the TOR established for WPAC/SCS RSG by APANPIRG to address urgent safety matters in the WPAC/SCS airspace had been substantially met and the WPAC/SCS RSG could therefore be considered for dissolution. The meeting recognized that the residual work items on the task list of the WPAC/SCS RSG – pertaining mainly to ATS route proposals – could be adequately handled by the South East Asia ATS Coordination Group (SEACG)

under their existing mandate. Further assistance was available from the Regional Airspace Safety Monitoring Advisory Group (RASMAG) and the ATM/AIS/SAR Sub Group if necessary.

3.2.8 Acknowledging the excellent outcomes that had been achieved by the WPAC/SCS RSG, the meeting agreed to the following Decision:

Decision 20/6 – Dissolution of Western Pacific/South China Sea RVSM Scrutiny Working Group

That, having completed the Terms of Reference established by APANPIRG,

- a) the Western Pacific/South China Sea RVSM Scrutiny Working Group (WPAC/SCS RSG) be commended for the swift and effective outcomes in satisfactorily addressing RVSM safety performance in the WPAC/SCS area, and
- b) the WPAC/SCS RSG be dissolved and any residual work items be allocated to Southeast Asia ATS Coordination Group (SEACG) and/or the Regional Airspace Safety Monitoring Advisory Group (RASMAG) and ATM/AIS/SAR Sub-Group as necessary.

First Meeting of ICAO Flight Plan and ATS Messages Task Force

3.2.9 The First meeting of the Asia/Pacific Flight Plan & ATS Messages Implementation Task Force (FPL&AM TF/1) was held at the Regional Office during March 2009. The FPL&AM TF/1 meeting had prepared a suitable PFF, as adopted by APANPIRG/20 (Agenda Item 3.0 refers) which would be periodically reviewed by the Task Force to ensure that it continues to accurately reflect the work programme of the FPL&AM/TF.

3.2.10 The TOR established by APANPIRG required that the FPL&AM TF, amongst other things, “...prepare and promulgate Asia/Pacific implementation strategies and plans...” Accordingly, the meeting reviewed the *Interim Strategy for the Implementation of New ICAO Flight Plan Format and Supporting ATS Messages* that had been prepared by the FPL&AM TF and recommended by the ATM/AIS/SAR/SG/19 for adoption by APANPIRG.

3.2.11 Including the word “Interim” in the title, FPL&AM TF/1 recognized that there were a number of limitations on the strategy. This was the first meeting of the Task Force. Only very limited work had commenced in States, so the Task Force had effectively no information on Amendment 1 implementation activities from States to refer to. The Task Force had also identified that a number of clarifications to Amendment 1 were necessary and had sought advice from ICAO HQ. The meeting noted that these clarifications had, in part, been provided by ICAO HQ but the FPL & AM/TF had not yet had the opportunity to consider them and integrate them into the Strategy.

3.2.12 However, the Interim Strategy provided valuable information to States and users about the way that the Asia/Pacific region intended to proceed with implementation. The Strategy would be updated by future meetings of the Task Force to incorporate the latest information available. In the meantime, there was a pressing need to increase awareness amongst States about the complexities involved and encourage them to commence work on implementation.

3.2.13 The meeting adopted the following Conclusion:

Conclusion 20/7 – Adopt Interim Strategy for Implementation of New Flight Plan Format

That the ‘*Interim Strategy for the Implementation of new ICAO Flight Plan Format and Supporting ATS Messages*’ provided in **Appendix A** to the APANPIRG/20 Report on Agenda Item 3.2 be adopted and published as the interim edition, and States and users be urged to commence implementation planning based on the interim strategy.

3.2.14 In order to ensure that States give early consideration to the flight plan implementation and provide suitable information to the FPL&AM TF on which to base coordination and implementation planning, the meeting also adopted an additional Conclusion as follows:

Conclusion 20/8 – Notification of State Transition Date to New Flight Plan Format

That, in order to align regional implementation planning, States inform the Regional Office by 1 July 2010 of their scheduled date and implementation methodology for transition to the new Flight Plan and ATS Message formats.

Approval of ANP Amendment APAC 09/5-ATS

3.2.15 Under the auspices of the Bay of Bengal ATS Coordination Group (BBACG) and ASIOACG, the Regional Office had assisted a number of the Bay of Bengal and the Indian Ocean States to formulate a suitable Basic Air Navigation Plan (BANP, Doc 9673) amendment proposal to designate a number of existing routes as RNAV routes over a widespread area of the Indian Ocean. Noting that in some cases these route changes would also have an impact on the Middle East (MID) and the Africa (AFI) BANPs, the Regional Office was conducting coordination with Cairo and Nairobi Regional Offices of ICAO to ensure that complementary amendments to the respective BANPs are progressed.

3.2.16 During the ATM/AIS/SAR/SG/19 Australia undertook to draft the body text of a model AIP SUP, and to circulate the text to all affected Asia/Pacific States prior to 31 July 2009 for comment. Each State would then prepare SUPs that include the route changes. The AIP SUPs would be published by all affected States on 10 September 2009, two AIRAC cycles prior to the effective date 19 November 2009. Contact details had been provided by each State and Australia would coordinate the arrangements via email. The Regional Office would be included in all correspondence to enable coordination with Cairo and Nairobi Regional Offices.

SSR Code Allocation – EUR & MID Regions

3.2.17 At the request of the European Air Navigation Planning Group (EANPG), the SSR Code Management Plan (CMP) for the ICAO European (EUR) Region had been developed by the EUROCONTROL Originating Region Code Assignment Method (ORCAM) SSR Code Steering Group (SCSG). The agreed allocation of SSR codes to States and ATC units, as well as the principles and associated procedures, are shown in the EUR Regional ANP – Facilities and Services Implementation Document (FASID), Part IV Communications, Navigation and Surveillance (CNS) – Supplement SSR Code Allocation List for the EUR Region, Part A. The detailed listing of codes, serving both international and domestic uses, is shown in Part B. Except for aircraft in state of emergency, or during communication failure or unlawful interference situations, and unless otherwise agreed by regional air navigation agreement or between a transferring and an accepting ATC unit, the

transferring unit shall assign Code 2000 to a controlled flight prior transfer of communications (PANS-ATM, Chapter 8, paragraph 8.5.2.2.8).

3.2.18 The meeting learned that four of the EUR Region Participating Areas (PAs) border with the Asia/Pacific Region and, similar to the coordination with MID Region, coordination with Asia/Pacific Region needs urgent attention in order to build an effective interface between these regions.

3.2.19 Accordingly, the meeting adopted the following Conclusion:

Conclusion 20/9 – SSR Code Coordination with ORCAM Secretariat

That, recognizing that four of the ten European (EUR) region SSR code Participating Areas (PAs) border Asian States, the Regional Office facilitate coordination with the European Originating Region Code Assignment Method (ORCAM) Secretariat to implement code management arrangements that avoid SSR code conflicts at the EUR/ASIA interface.

Bay of Bengal ATFM Update – BOBCAT Activities

ATFM/TF honoured with ATCA Industrial Award

3.2.20 The meeting was pleased to be informed that the United States Air Traffic Control Association (US ATCA) had honoured the Air Traffic Flow Management Task Force (ATFM/TF) with the 2008 ATCA Industrial Award during the November 2008 ATCA Conference. The ATCA Industrial Award is a medallion given to an industry or group of industries for an outstanding achievement or contribution which has added to the quality, safety or efficiency of air traffic control.

Early and Late Departures

3.2.21 Recognizing that both ANSPs and airlines had responsibilities in addressing the continuing challenge of meeting Allocated Wheels-Up Time (AWUT), the meeting sought to ensure that the airlines and airports identified in the periodic Air Traffic Flow Management (ATFM) data analysis were apprised of their specific circumstances and requested to take steps to improve their performance in this area.

3.2.22 The meeting adopted the following Conclusion in this respect:

Conclusion 20/10 – ATFM Compliance-Advice to Airlines and Airports

That, on behalf of the ATFM/TF, the Regional Office seeks assistance in properly complying with ATFM procedures from the specific airlines and airports identified by the ATFM/TF as contributing to poor ATFM performance because of early or late departures.

Operational Trial of the Bypass Procedure for L759 using M770

3.2.23 The meeting was advised of the bypass procedure utilizing ATS route M770 that has been successfully put on operational trial since 18 December 2008, to alleviate traffic bunching on L759. The procedure proved to be very effective in alleviating the bunching of traffic which would be more in evidence in seasonal heavier traffic scenarios. Thailand thanked India, Myanmar and the ATFM/TF in supporting the trial.

3.2.24 The meeting requested the States concerned to continue discussions with the objective of making the bypass procedure permanent. Agreement was reached that India and Thailand would coordinate with Myanmar and Pakistan over the next few weeks with a view to establishing more permanent arrangements from the expiry of the current trial NOTAMs.

United States – CAR/SAM ATFM Project

3.2.25 The United States reported on the activities and accomplishments of the ICAO Air Traffic Flow Management Regional Project for Latin America (RLA/06/091). A questionnaire that will be used in Latin America designed to gather information from States related to ATFM was provided. The United States also provided the ATFM Roadmap for the CAR/SAM Region and a draft CAR/SAM ATFM Manual. ATFM implementation in the CAR/SAM Region will require the development of detailed guidelines for States and International Organizations.

3.2.26 The meeting noted that the documentation provided by the United States was in draft form and will require additional discussion and exchange of ideas to develop the final products for the CAR/SAM Region.

ATFM Seminar/Workshop (October 2008, Fukuoka, Japan)

3.2.27 Recognizing that the ATFM Seminar (October 2008, Fukuoka) called for by APANPIRG/18 provided a good opportunity to influence regional ATFM planning, the Regional Office elected to include a 'Workshop' component to allow for opportunity for recommendations to come forward. The outputs of the ATFM Seminar/Workshop were presented as a series of six outcomes and five recommendations and, based on these, the meeting adopted the following Conclusions:

Conclusion 20/11 – ATFM Steering Group and Concept of Operations

That a regional ATFM Steering Group be constituted and tasked with preparing an Asia/Pacific Regional ATFM Concept of Operations based on analysis of regional data and traffic flows. The ATFM Steering Group should consider the outcomes and recommendations from the October 2008 ATFM Seminar/Workshop (Fukuoka, Japan) and information about the CAR/SAM ATFM Project contained in IP/3 to APANPIRG/20 as guidance in deriving its Objectives and Terms of Reference.

Conclusion 20/12 – Adopt ATFM Communications Manual

That the *Air Traffic Flow Management (ATFM) Communications Handbook for the Asia/Pacific Region*, as shown in **Appendix B** to the APANPIRG/20 Report on Agenda Item 3.2, be adopted and circulated as regional guidance material.

Air Traffic Flow Management (ATFM) Survey for Asia/Pacific

3.2.28 The meeting recognized the importance of providing information about the current status of ATFM in the region to the ATFM Steering Group and agreed to utilize the ATFM Survey Questionnaire that had been prepared by the ATM/AIS/SAR and the CNS/MET Sub-Groups based on the information from the CAR/SAM ATFM Project. The meeting formulated the following Conclusion:

Conclusion 20/13 – Conduct Regional ATFM Survey

That a survey of Asia/Pacific States be conducted based on the questionnaire at **Appendix C** to the APANPIRG/20 Report on Agenda Item 3.2, with the objective of benchmarking the current status of Air Traffic Flow Management (ATFM) activities in the Asia/Pacific Region.

Establishment of Southeast Asia Route Review Task Force (SEA-RR/TF)

3.2.29 The meeting noted that the ATM/AIS/SAR Sub-Group had established the Southeast Asia Route Review Task Force (SEA-RR/TF) to undertake a review of ATS routes in this area in accordance with the TOR shown at **Appendix D** to the Report on Agenda Item 3.2. The Task Force would analyze and implement appropriate measures, where environmental and efficiency benefits could be positively enhanced using the ICAO Regional and State Performance Framework methodology. The meeting recognized that these activities would be undertaken based on PBN concepts and in accordance with the provisions of the Regional PBN Implementation Plan.

Develop Global Oceanic and Remote Interface Control Document (ICD)

3.2.30 The meeting recognized the benefits that would accrue from a common Global Oceanic and Remote Interface Control Document (ICD), and thanked the United States for agreeing to undertake this work. The meeting requested that the Regional Office take Asia/Pacific coordination responsibility for the project and adopted the following Conclusion:

Decision 20/14 – Support for Global ICD for AFTN AIDC

That recognizing the benefits to be gained from globally harmonized interface arrangements for AIDC, APANPIRG supports the work being undertaken by the United States to coordinate a global Interface Control Document for AFTN AIDC and invites the Asia/Pacific Regional Office to act as the regional point of contact for this work.

Indonesia - Establishment of Radar Service in Upper Sectors Ujung Pandang

3.2.31 The meeting noted that Indonesia had taken some actions to prepare the implementation of radar services in the upper airspace of the Ujung Pandang FIR as follows:

- Training completed by 36 air traffic controllers with Airservices Australia;
- ATC infacility training was held in June and July 2008;
- Operational testing is still running; and
- Final inspection and publishing of AIP Supplement in July 2009.

3.2.32 The meeting commended the actions taken by Indonesia. The implementation of radar surveillance would allow the current 15 minute and/or 10 minute longitudinal separation standards to be replaced with a 10 NM radar standard. This would have a dramatic effect by increasing airspace capacity enormously, as well as lowering workload for air traffic controllers.

USA - Operational Trial of ADS-B In-Trail Procedures

3.2.33 The United States provided an in-depth update on planning by the FAA to conduct an operational trial of ADS-B In-Trail Procedures (ITP) in the South Pacific. For ADS-B ITP, the maneuvering aircraft obtains the flight identification on proximate ADS-B equipped non-maneuvering aircraft using ADS-B 'IN' technologies. Based on the ADS-B data from the non-maneuvering or reference aircraft, a pilot can make an ITP altitude change request to ATC. The controller, who maintains separation responsibility at all times can then approve the manoeuvre. The planned trial will be undertaken with United Airlines B747 aircraft, and will be closely monitored and supervised by the FAA. The ATM/AIS/SAR/SG/19 meeting supported the ADS-B ITP operational trials in the South Pacific, noting the significant economic and efficiency benefits for both service providers and airspace users.

USA - Development of ADS-C In-Trail Procedures

3.2.34 The United States also updated the ATM/AIS/SAR/SG/19 meeting about the FAA's planning for an operational trial of ADS-C ITP in the Pacific. An overview was provided of initiatives to assess the use of ADS-C to allow for a reduction below RNP 4-based 30 NM longitudinal separation for properly equipped aircraft (RNP-4, CPDLC, ADS-C and GNSS) that will climb/descend through the blocking level. The current target longitudinal standard being assessed is 16 NM and distance measurement will be carried out by requesting near simultaneous periodic ADS-C reports.

3.2.35 This procedure is based on in-trail Distance Measuring Equipment (DME) rules in the PANS-ATM, paragraph 5.4.2.3.2. Aircraft pair distance verification is performed by ground flight tracking systems, such as the FAA's Ocean21 system, using near simultaneous ADS-C demand contract reports. As with the existing DME procedure, responsibility for separation assurance remains with air traffic control. Controller procedures have already been developed; however, at this time they are somewhat cumbersome in that they require several manual inputs by the controllers. If the demonstrations prove successful, it is the intent of the FAA to automate the controller procedures.

Japan – Continuous Descent Arrivals (CDA)

3.2.36 Japan provided updated information on their Continuous Descent Arrivals programme which was initially implemented as an operational trial at Kansai International Airport (RJBB) during specified periods from 7th May 2009. The CDA operational trial used the services of Japanese air carriers only. The timing of the trial was limited between 23:00 JST (14:00 UTC) and 07:00 JST (22:00 UTC) when there is very little airport demand.

3.2.37 Statistics confirm that a complete CDA will save between 500 pounds (lbs) (B763) and 1,000 lbs (B744) of fuel on each flight over the standard arrival profile into RJBB. Nevertheless, due to airport demand, it has not always been possible for aircraft to fly the full CDA. As the arrival demand increases, aircraft flying the CDA may need to be vectored for arrival spacing, which in turn may cause the CDA to be terminated. There are, however, still fuel savings to be gained for the aircraft flying a partial CDA.

3.2.38 After the 97 day operational trial, there were 319 aircraft which had requested CDA operations from cruising flight levels, of which 292 aircraft had been approved to carry out a CDA operation.

3.2.39 JCAB will continue the CDA operational trials at RJBB by Japanese airlines for another 2 or 3 months for evaluation purposes to study how to increase the percentage of flights able to perform a full CDA. It is then expected that CDA will be applied to all aircraft, including non-Japanese carriers, inbound to RJBB with ETA between 2300JST and 0700JST.

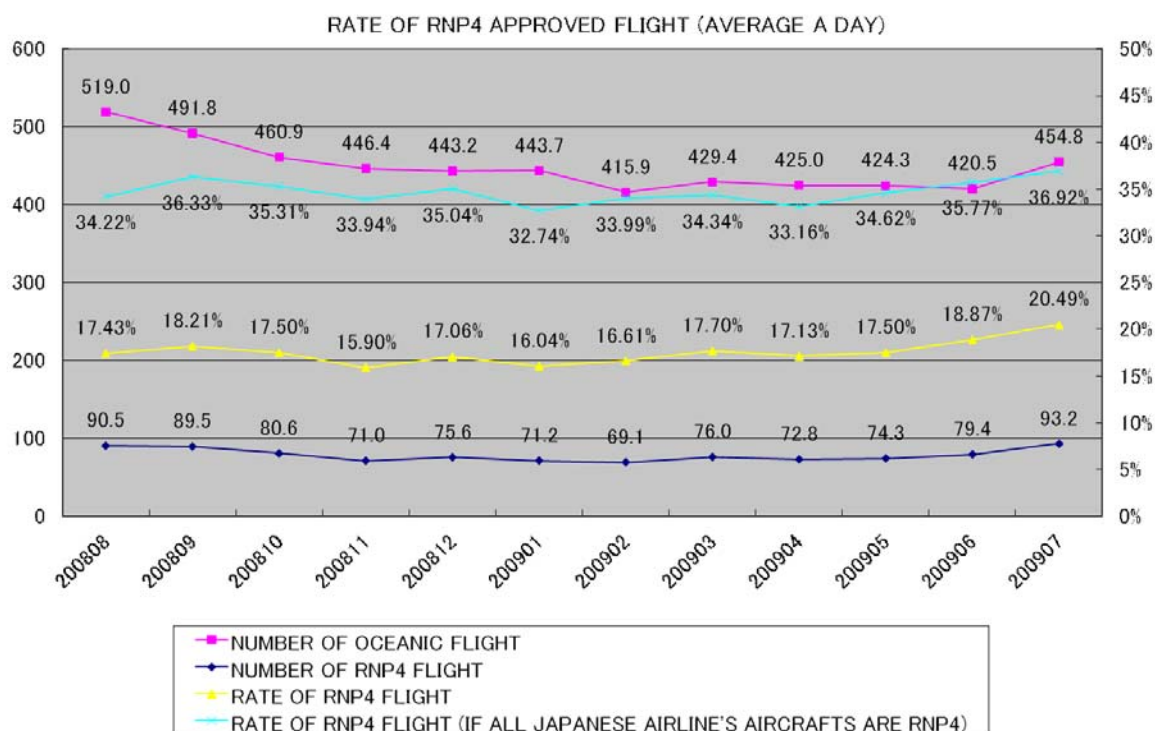
Japan - Data Link Operations and Numbers of RNP 4 Aircraft in the Fukuoka FIR

3.2.40 At APANPIRG/19, Japan informed that JCAB had commenced the trial application of 30 NM longitudinal separation minimum within the whole oceanic airspace of the Fukuoka FIR in August 2008. This separation minimum is applied only between aircraft with RNP 4 approval. Between an RNP 4 approved aircraft and an RNP non-approved aircraft, and between RNP 4 non-approved aircraft, 50 NM or 10 minutes with the Mach Number Technique (MNT) or 15 minutes longitudinal separation shall be applied.

3.2.41 All ANSPs and operators recognized that this separation reduction would provide aircraft with more opportunity to fly at or closer to an optimum altitude than before as well as increase airspace capacity and ATC flexibility. Also this reduction contributes to reduce fuel burn and emissions. JCAB conducted a study of environmental benefits of the RNP 4-based separation reduction, and the study indicated significant improvement as below;

- Estimated annual fuel saving will be approximately 24,800,000 lbs; and
- Estimated annual reduction of CO2 emissions will be about 34,400,000 kg.

3.2.42 The graph below shows number of flights and number of RNP 4 flights in the oceanic airspace in the Fukuoka FIR per day from August 2008.



3.2.43 Australia noted that the rate of the RNP 4 equipage in the oceanic airspace in the Fukuoka FIR was as low as 20 percent and encouraged to investigate in the situation where the rate is kept low. IATA supported the RNP implementation in the region and endorsed the expansion of the RNP 4 requirement to the other key ATS routes.

3.2.44 The meeting recalled APANPIRG Conclusion 19/7 that Pacific operators be urged to equip with RNP 4 avionics as early as possible, but not later than 2012, and agreed that a survey of aircraft RNP 4 equipage and certification would be useful in establishing the current situation. Conclusion 19/7 had set the timeline of 2012 and therefore the survey should establish the intentions of operators in terms of equipage and certification.

Conclusion 20/15 – Survey of RNP 4 Equipage and Approvals

That during 2010 the Regional Office conducts a regional survey to establish the current and near term equipage and approvals status for RNP 4 operations.

Japan - RNAV 5 Preferential Operation

3.2.45 In order to increase airspace capacity, improve efficiency and ensure safety, JCAB had introduced parallel RNAV 5 routes between major city pairs, and limited some RNAV 5 routes for one-way use. However, conventional VOR routes still exist in close vicinity to RNAV 5 routes and are available for flight planning of RNAV 5 non-approved aircraft. This mixture of traffic in the same airspace has caused increased controller workload. Japan decided to introduce RNAV 5 preferential operations, named “Sky Highway”, where the segregated operations of the RNAV and non-RNAV takes place at FL 290, which will be in force from October 2010 in domestic airspace of the Fukuoka FIR.

Japan & USA - User Preferred Route (UPR) Implementation Updates

3.2.46 Japan and the United States jointly presented an update on User Preferred Routes (UPR) in the Pacific region. Estimates of the savings have been calculated on an annualized basis as follows:

- a) Russian Trans-east UPRs
 - 1.09 Million kg Fuel
 - 3.41 Million kg carbon dioxide (CO₂) Emissions
- b) California – South Pacific UPRs
 - 9.61 Million kg Fuel
 - 30.36 Million kg CO₂ Emissions
- c) Japan – New Zealand/Caledonia UPRs
 - 2.09 Million kg Fuel
 - 6.54 Million kg CO₂ Emissions
- d) Asia – Hawaii UPRs
 - 2.88 Million kg Fuel
 - 9.1 Million kg CO₂ Emissions

e) RJAA – YSSY/YBBN/YBCG/YBCS UPRs

- 1.89 Million kg Fuel
- 5.91 Million kg CO₂ Emissions

Republic of Korea - Control Sector Realignment of Incheon FIR

3.2.47 The Republic of Korea provided information on the operation of the Jeju Sector within Incheon FIR which became effective from 29 August, 2009. For the last 10 years, the air traffic volume in the Incheon FIR had increased at a rate of 5.3% annually. Furthermore, the volume of air traffic in this portion of the FIR is concentrated on B576 and G597. In response to the increase of air traffic volume on B576, to reduce coordination and radio frequency changes and taking into account the high proportion of aircraft in level flight on B576 compared to A586 where many ascent/descent activities occur, the South Sector of the Incheon FIR was divided into two sectors; the South Sector and the Jeju Sector.

3.2.48 A further initiative to increase the air route capacity on B576, the Republic of Korea is planning to construct parallel air routes using RNAV 2 in accordance with the PBN implementation plan. In addition, it is proposed to divide the North Sector (between AGAVO and KARBU on G597) into the North Sector and the Capital Sector to improve airspace efficiency.

ATM Regional Guidance Materials*Asia/Pacific ATS Route Catalogue*

3.2.49 The ATS Route Network Review Task Force (ARNR/TF, disbanded) developed the *Asia/Pacific ATS Route Catalogue*. APANPIRG/16 considered the intent of the ARNR/TF and comments in regard to the status of the Catalogue, and accepted the catalogue as a regional planning tool under the terms of *Decision 16/9 – Acceptance of the Asia/Pacific ATS Route Catalogue*. Accordingly, the catalogue Version 1 was published in August 2005.

3.2.50 On-going updates have been undertaken by the Regional Office based on the information made available from States and airspace users. Version 6 is now available from the ICAO Asia/Pacific web site (<http://www.bangkok.icao.int/>) under the menu “APAC eDocuments”.

ICAO Five-Letter Name-Codes and Route Designator Database (ICARD)

3.2.51 The web-based ICAO Five-Letter Name-Codes (5LNC) and Route Designators Database (ICARD) system allows end-users to electronically view, search, reserve, allocate, modify and receive a confirmation of the assigned code. If the user is an authorized State user or an ICAO Regional Officer, the user can search, reserve, allocate and modify 5LNC from the reserve list of 140,000 codes while ensuring worldwide uniqueness, as well as browse the entire assigned 5LNC database.

3.2.52 APANPIRG/18 adopted *Conclusion 18/11- Endorsement of the Use of ICARD System* to facilitate and enhance the management of 5LNC in the Asia/Pacific Region by using the ICARD system. Asia and Pacific States now using the system include Australia, China, Japan, Malaysia and New Zealand Pakistan, Republic of Korea, Singapore and Thailand. Other States are invited to join and should contact the Regional Office for joining information.

Guidance Material for the End-to-End Monitoring of Data Link Systems

3.2.53 Adopted under Conclusion 16/20, the *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region* was prepared by the Regional Airspace Safety Monitoring Advisory Group (RASMAG) to provide a set of working principles for ATS data link system performance monitoring that would be applied by all States implementing these systems, as well as providing detailed guidance on the requirements for establishing and operating a FANS Interoperability/Implementation Team (FIT) and Central Reporting Agency (CRA).

3.2.54 Version 3.0 is now available from the ICAO Asia/Pacific web site (<http://www.bangkok.icao.int/>) under the menu “APAC e-Documents”.

Model National Contingency Plan

3.2.55 In reviewing the draft Contingency Plan for the Jakarta FIR developed by an ICAO Special Implementation Project in 2006, APANPIRG/17 (August 2006) recognized that the final version of the Plan would serve as a useful model for other States of the region in preparing contingency plans and formulated *Conclusion 17/11 – Adoption of Model National ATM Contingency Plan*. APANPIRG/18 was informed that the Contingency Plan Finalization Meeting (April 2007, Jakarta) had reviewed and formally adopted the Indonesia contingency plans.

3.2.56 The model contingency plan, “*Indonesia ATS Contingency Plan Jakarta FIR*”, is now available from the ICAO Asia/Pacific web site (<http://www.bangkok.icao.int/>) under the menu “APAC e-Documents”.

Guidance Material for Data Link Ground Equipment Procurement and Implementation

3.2.57 APANPIRG/18 formulated Conclusion 18/5 to adopt the *Guidance Material for the Asia/Pacific Region ADS/CPDLC/AIDC Ground Systems Procurement and Implementation*.

3.2.58 Version 2 is now available from the ICAO Asia/Pacific web site (<http://www.bangkok.icao.int/>) under the menu “APAC e-Documents”.

AIDC Interface Control Document

3.2.59 The AIDC Review Task Force meeting (February 2007) updated the AIDC Interface Control Document (ICD), which was subsequently adopted under Conclusion 18/8.

3.2.60 Version 3 is now available from the ICAO Asia/Pacific web site (<http://www.bangkok.icao.int/>) under the menu “APAC e-Documents”.

Guidance Material for Aeronautical Information Services (AIS) in the Asia/Pacific Region

3.2.61 The second meeting of the AIS Implementation Task Force (AITF/2, February 2007) considered proposals in relation to updates to Chapter 3 of the *Guidance Material for Aeronautical Information Services (AIS) in the Asia/Pacific Region* to adopt the new Euro OPADD (Operating Procedures for AIS Dynamic Data) Edition 2.0, with the exception of Section 6 which describes specific European arrangements, and agreed to recommend an amendment to the regional AIS guidance manual.

3.2.62 APANPIRG/18 agreed to adopt the Chapter 3 amendment. The First Edition with the Second Amendment is now available from the ICAO Asia/Pacific web site (<http://www.bangkok.icao.int/>) under the menu “APAC e-Documents”.

Aeronautical Information Services

Fourth Meeting of the AIS-AIM Implementation Task Force (AAITF/4)

3.2.63 The meeting noted that the fourth meeting of the AIS-AIM Implementation Task Force (AAITF/4, February 2009) was held in Narita, Japan. The Task Force had reviewed the AIS-AIM transition issues, roadmap and Annex changes and noted that the Electronic Terrain and Obstacle Data (eTOD) applicability date for Areas 2 and 3 would be extended from 2010 to 15 November 2012 (proposed Annex 15 – *Aeronautical Information Services*, paragraph 10.6.1.2 refers). Additionally, as the Aerodrome Terrain and Obstacle Chart — ICAO (Electronic) is based on Annex 15 specifications for the Areas 2 and 3 eTOD, a consequential amendment had been proposed to Annex 4, paragraph 5.2.1.

AIS Automation/Electronic Terrain and Obstacle Data Seminar/Workshop

3.2.64 The ICAO AIS Automation/eTOD Seminar/Workshop (February 2009), graciously hosted by JCAB of the Ministry of Land, Infrastructure, Transport and Tourism was held in Narita, Japan in conjunction with AAITF/4. Based on the recommendations from the Seminar/Workshop, the meeting formulated the following Conclusion:

Conclusion 20/16 – Assistance to States to Implement Electronic Terrain and Obstacle Data (eTOD)

That, in light of the fact that:

- a) within the Asia and Pacific region, there is a varying degree of implementation status and readiness for the existing Annex 15, Chapter 10 eTOD Standards and Recommended Practices (SARPs);
- b) significant cost and institutional issues prevail as impediments to global eTOD implementation; and

ICAO consider providing short- and long-term assistance to States in order to build their capacity to provide eTOD in a sustainable and cost efficient manner.

Note: An appropriate form of providing assistance could include establishment of an ICAO Technical Cooperation Project with funding sought from donor agencies.

Study of Application of AIRAC Date/Time in Asia Pacific Region

3.2.65 The meeting was informed about discussions during the ATM/AIS/SAR/SG/19 meeting on the difference in interpretation and application of AIRAC time in Asia/Pacific region. Because of the many different time zones across the region and general displacement from the Greenwich meridian, the AIRAC times corresponded with high traffic periods in some areas that were not appropriate to commence complex implementations. In the most extreme example, the situation results in two neighbouring States implementing AIRAC changes 24 hours apart. While a single AIRAC date/time for the region would be the ideal solution, this was not considered achievable.

3.2.66 The United States noted that this was a flight safety issue and urged affected parties to quickly find a solution. The States involved in the 24 hour difference engaged in discussions during the meeting and agreed to conduct further coordination with a view to swiftly addressing this particular situation.

USA - ICAO SARPS Amendment for Additional NOTAM Field for Cross-Reference of Digital Aeronautical Information and Legacy Text NOTAM

3.2.67 The United States presented a proposal to ATM/AIS/SAR/SG/19 for the addition of a “Y Field” to the ICAO NOTAM, SNOWTAM and ASHTAM formats. The “Y Field” provides a mechanism to transition from legacy text-based notices to digital aeronautical information and the digital NOTAM. The “Y Field” contains a resource link that can be used to cross-reference to digital aeronautical information supporting the published ICAO compliant NOTAM.

3.2.68 Acknowledging that there was insufficient technical representation at the meeting to be able to make an informed decision on the United States proposal and that it was intended that the “Y field” proposal would be reviewed at the Global AIM Conference in South Africa and the AIS-AIMSG in Montreal, updated information would be available in due course. The meeting requested the United States to continue the coordination efforts on this matter with a focus on any potential impacts in operational areas and provide updated information to appropriate forums including the Asia/Pacific AAITF as it became available.

India – Update on AIS/AIM Implementation

3.2.69 India informed the meeting that the provision of Aeronautical Information of sufficient quality, accuracy and timeliness was a recognized key enabler of the present and future ATM systems. ICAO Annex 15 Standard and Recommended Practices (SARPS) therefore require implementation of automation in AIS to achieve desired data accuracy and integrity in line with this objective. India had commenced automation in AIS as early in the year 2000 at its International NOTAM offices of Delhi, Mumbai, Kolkata and Chennai. An Integrated AIS/AIM Automation System is currently being implemented to bring in quality checks on the production processes of AIP products through harmonization of data chain management from origination to publication stages.

3.2.70 The new system will be an integrated computer network, based on AICM/AIXM concepts, to assist and support the workflow of AIS office using a common database of aeronautical information, from which the data can be exploited, to produce automated document outputs such as AIP and its amendments, aeronautical charts, Instrument flight procedure Design etc. The client workstations connected to the Central Database will foresee the functional requirements of different airport units with appropriate application tools. Major features of these application tools are given below:

- **Aeronautical Data Management**

This tool allows management of aeronautical data through customized database records/tables schemes to support data insertion/extraction/updating of information and aeronautical spatial features (with their attributes).

- **Aerospace/Procedure Design Management**

Through a group of tools in this module the flight procedure designers can create, visualize, check and modify 3-D flight procedures and 3-D airspace elements.

- **AIP production/publication Management**

A tool that extracts information from a central database and automatically generates ICAO aeronautical publication products such as an AIP, AIP Amendment or AIP Supplement. Charts and other graphic objects are also automatically treated. The module is capable of producing HTML or XML output to obtain a web-based AIP or an eAIP version.

- **Aeronautical Chart Maintenance**

This tool provides automatic extraction and charts symbolization according to the release cycles by retrieving aeronautical data stored in the central database using the CAD/GIS engines.

- **Navigation Aids Performance Assessment related to designed Instrument Flight Procedures**

An analysis tool devoted to inspecting the radio electrical features of installed navaids and model the real propagation phenomena found in airport scenario where signals (VOR, DME, ILS, ATC radar) interfere with artificial or natural obstructions.

Japan - Activities towards AIM

3.2.71 Japan advised their AIS Center (AISC) had reached decisions to provide electronic AIP (eAIP) on the AIS JAPAN website and DVD versions from 27 August 2009. The eAIP is generated from static data (SD), which is based on aeronautical information exchange model (AIXM) 4.5 and managed in the new database. The eAIP is available in the form of HTML and PDF.

Multiple Series NOTAMS – Implementation in United States

3.2.72 The United States presented information providing an outline of what the Federal Aviation Administration (FAA) is planning regarding the implementation of multiple series usage for international NOTAMs issued by the United States. This change was necessary as an interim step towards the United States NOTAM System (USNS) becoming ICAO-compliant and meeting the future needs of digital aeronautical information exchange.

3.2.73 The current NOTAM system that is in use in the United States typically has 11,000 to 16,000 active NOTAMs and exceeded the maximum NOTAM number, 9999, on many occasions. A first phase transition to Series A and K NOTAMs will be followed by transition to a complete ICAO formatted NOTAM according to Annex 15 with the addition of multiple (up to 18) series to cover appropriate topics.

Search and Rescue

SAR Agreements and SAR Matrix

3.2.74 The meeting reviewed and updated the APANPIRG list of SAR Agreements and the SAR Capability Matrix Table. Details of the June 2009 Arrangement for Coordination of SAR services between New Zealand and Chile were included in the List of SAR Agreements. Viet Nam also provided information about their agreements with Cambodia and Lao PDR which took effect from March 2009. It was noted that the SAR Matrix had been updated as required by APANPIRG

Conclusion 19/11 and now included detailed guidance on completion of the Matrix. The meeting thanked the United States for their work in this regard.

3.2.75 The updated List of SAR Agreements and the SAR Capability Matrix Table are presented in **Appendices E and F** to the Report on Agenda Item 3.2, respectively.

3.2.76 The meeting also noted the successful outcomes of the Hong Kong Civil Aviation Department (HK CAD) 2008 international SAREX during October 2008 and the supporting ICAO SAR Seminar.

Lessons Learned Regarding Termination of Satellite Detection of 121.5 Hz Signals from Distress Beacons

3.2.77 In relation to the termination from 1 February 2009 of the COSPAS SARSAT satellite capability to detect 121.5 MHz signals from distress beacons, meaning that SAR authorities no longer have satellites providing the approximate location of 121.5 MHz distress beacons, the United States presented information describing how their SAR services had to adjust to this change. In re-training and educating people in the United States, many facts and lessons learned had to be brought to their attention, including:

- a) 121.5 MHz VHF AM is still the international aeronautical voice distress frequency.
- b) 121.5 MHz is still a low-power homing signal on the 406 MHz ELT and EPIRB.
- c) International carriage requirements under ICAO and the International Maritime Organization (IMO) are for the 406 MHz distress beacon, and no longer the 121.5 MHz version but, national regulations may allow domestic use of 121.5 MHz distress beacons.
- d) There are many 121.5 MHz ELTs and EPIRBs still in use.
- e) Aircraft, and many without direction finding equipment, will hear the audible 121.5 MHz alert from these distress beacons and report them to air traffic control centres.
- f) The higher the altitude of the aircraft hearing the 121.5 MHz signal, the larger the search area becomes in which the distress beacon may be located.
- g) Personal Locator Beacon (PLB) 406 MHz distress alert signal may cause confusion for national authorities as to which agency has responsibility to register the beacon, or to receive the alert, or to respond to the alert.
- h) There is a need to determine the location of audible 121.5 MHz distress beacon alerts.

3.2.78 The meeting learned that in many cases national regulations still allowed use of 121.5 beacons in large populations of aircraft and that without satellite tracking ability this can lead to dramatically increased difficulties in locating such beacons. The United States made available recently developed guidance on *Search Planning for Audible 121.5 MHz Distress Beacon Alerts* for review by the meeting. The following Conclusions were adopted in this respect:

Conclusion 20/17 – SAR Guidance on 121.5 MHz Search Planning

Recognizing that large populations of aircraft would continue to use 121.5MHz distress beacons after the February 2009 cessation of COSPAS SARSAT Satellite tracking capability, States consider the guidance material “*Search Planning for Audible 121.5 Distress Beacon Alerts*” contained in **Appendix G** to the APANPIRG/20 Report on Agenda Item 3.2 when developing SAR procedures and training documentation.

Conclusion 20/18 – Provide SAR 121.5 MHz Guidance to ICAO/IMO JWG

That the Regional Office seek the assistance of the United States in providing a copy of the guidance material “*Search Planning for Audible 121.5 Distress Beacon Alerts*” contained in Appendix G to the APANPIRG/20 Report on Agenda Item 3.2 to the ICAO/IMO Joint Working group on SAR for consideration as an amendment to the *International Aeronautical and Maritime SAR (IAMSAR) Manual*.

ATM/AIS/SAR Task List

3.2.79 The ATM/AIS/SAR/SG/19 meeting reviewed and updated the Sub Group Task List, noting the alignment with the proposed regional performance objectives as described in Agenda Item 3. The meeting agreed that the Task List suitably reflected the work programme of the Sub-Group and formulated the following Decision:

Decision 20/19 – ATM/AIS/SAR Task List

That the ATM/AIS/SAR Sub-Group Task List and attachments contained in Appendix A to the ATM/AIS/SAR/SG/19 Report on Agenda Item 10 be adopted as the current work programme for the ATM/AIS/SAR Sub-Group of APANPIRG.

ASIA/PACIFIC REGION

INTERIM STRATEGY FOR THE IMPLEMENTATION OF NEW ICAO FLIGHT PLAN FORMAT AND SUPPORTING ATS MESSAGES

Recognizing that:

- 1) Dynamic information management will assemble the best possible integrated picture of the historical, real-time and planned or foreseen future state of the ATM situation and provide the basis for improved decision making by all ATM community members;
- 2) The *Global Air Traffic Management Operational Concept* (Doc 9854) requires information management arrangements that provide accredited, quality-assured and timely information to be used to support ATM operations;
- 3) ATM Requirement 87 in the *Manual of Air Traffic Management System Requirements* (Doc 9882) provides that 4-D trajectories be used for traffic synchronization applications to meet ATM system performance targets, explaining that automation in the air and on the ground will be used fully in order to create an efficient and safe flow of traffic for all phases of flight;
- 4) The amended ICAO Flight Plan and associated ATS Message formats contained in Amendment 1 to the Fifteenth Edition of the PANS ATM (Doc 4444, applicable 15 November 2012) have been formulated to meet the needs of aircraft with advanced capabilities and the evolving requirements of automated air traffic management systems; and
- 5) The complexities inherent in automated computer systems preclude the adoption of a single regional transition date and transitions to the new flight plan provisions will therefore occur throughout the declared transition period. Accordingly, pursuit/adoption of a single 'global' implementation date is also not viable.

The Asia/Pacific implementation of Amendment 1 to the PANS-ATM shall:

- 1) Ensure that all States and airspace users implement the full provisions of Amendment 1 from 15 November 2012, not just selected aspects of the Amendment;
- 2) Acknowledge that States not implementing the full provisions of Amendment 1 from 15 November 2012 are obligated to publish the non compliance in State AIP as a 'significant difference' well in advance of the 15 November 2012 applicability date and will be included on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields; and
- 3) Ensure that, from 15 November 2012, all States and airspace users accept and disseminate 'NEW' flight plan and associated ATS message formats only and capabilities for 'PRESENT' flight plan provisions are discontinued.

(Note: In the context of the implementation, 'PRESENT' refers to the existing flight planning and ATS message formats as defined in the current version of the PANS-ATM and 'NEW' refers to the amended provisions as contained in Amendment 1 to the PANS-ATM.)

The Asia/Pacific transition to the PANS-ATM Amendment 1 provisions shall:

- 1) Comply with the regional guidance provided by APANPIRG's Asia/Pacific Flight Plan and ATS Messages Task Force (FPL&AM/TF);
- 2) Preserve global consistency in implementation by basing implementation activities, to the extent possible, on Guidelines 1 to 6 described in the ICAO guidance material in State Letter AN 13/2.1-09/9, dated 6 February 2009;
- 3) Ensure that the FPL&AM/TF undertakes coordination to facilitate harmonization with implementations in neighbouring regions;
- 4) Eliminate or minimize State specific constraints and, if constraints are identified as necessary, implement such constraints on a regional or sub regional basis in preference to an individual State basis;
- 5) Declare a transition period from 1 July 2011 until 15 November 2012, and encourage States to implement 'NEW' capability between 1 July 2011 and 1 July 2012;
- 6) Not implement 'NEW' capability by States or users before the commencement of the transition period (i.e. no 'NEW' before 1 July 2011);
- 7) Encourage States to immediately commence preparations to implement Amendment 1 provisions and report progress to the FPL&AM TF periodic meetings;
- 8) Require States to inform the Regional Office of scheduled transition date by 1 July 2010 for relay to the FPL&AM TF;
- 9) Consider a regional constraint on requiring acceptance of flight plans more than 24 hours prior to Estimated Off Blocks Time (EOBT) during the transition period, to mitigate Date Of Flight (DOF) complexities;
- 10) Require that States retain capability to simultaneously support 'PRESENT' and 'NEW' provisions (flight plan and ATS message format) from the activation of their 'NEW' capabilities until the end of the transition period;
- 11) Encourage users to implement capability to simultaneously support 'PRESENT' and 'NEW' provisions from activation of their 'NEW' capabilities until the end of the transition period;
- 12) Recognize that until a number of adjacent States are providing 'NEW' capability, advantages do not accrue to users. Accordingly, users may not commence transition until the latter part of the transition period; and
- 13) Avail of States with expertise in automated ATM ground systems to support the conduct of a Regional Office Seminar during November 2009.

(last amended FPL&AM TF/1, March 2009)

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE**



**AIR TRAFFIC FLOW MANAGEMENT (ATFM)
COMMUNICATIONS HANDBOOK FOR
THE ASIA PACIFIC REGION**

Version 1.0 – September 2009

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

FOREWORD

Centralized air traffic flow management (ATFM) providers are best able to communicate the capacity of their national airspace systems to accept traffic from adjacent international air traffic service (ATS) providers. As coordination and collaboration efforts to balance traffic demand and airspace/airport capacity intensify between affected States, common ATFM procedures and communication are essential. Once procedures are defined, a key element in removing language barriers is establishing common terms and phrases. Terminology and phraseology differences in the operational application of ATFM procedures could be a potential source of confusion during communications, both written and verbal, between international ATFM units.

Common terminology is an essential element in exchanging definitive, clear, and concise communication between international ATFM units. Likewise, the phraseology should follow a technical pattern for the exchange of standardized and harmonized messages. This Asia/Pacific guidance material is intended to support States in meeting these objectives and has been adopted by APANPIRG/20, under the terms of Conclusion 20/12, for this purpose. As this is the first document of its kind for the region, APANPIRG noted that further development and amendment was likely. However, it is expected that the guidance herein will be equally applicable to both verbal ATFM coordination exchanges and as the basis for written ATFM messages. Although the terminologies and phraseologies presented herein are not intended to be a requirement for ATFM communications, they are recommended to States as guidelines for the exchange of ATFM messages.

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1. Introduction

1.1 ATFM is a function of air traffic management (ATM) established with the objective of contributing to a safe, orderly, and expeditious flow of traffic while minimizing delays. This is accomplished through the dynamic use of operational traffic management initiatives supported by continuous coordination and analysis.

1.2 The purpose of ATFM is to balance air traffic demand with airspace and/or airport capacity to ensure the most efficient use of the airspace system. This is achieved by ensuring that capacity is utilized to the maximum extent possible and that air traffic volumes are compatible with the capacities declared by the appropriate air navigation service providers.

1.3 ATFM implementation should provide for the organization and handling of the flow of air traffic in such a way that, while ensuring the safe, orderly and expeditious flight of individual aircraft, the totality of the traffic handled at any given point or in any given area is compatible with the capacity of the air traffic control system.

1.4 The operation of ATFM service includes the application of ATFM measures that are designed to achieve the optimum flow of traffic. These measures include, but are not limited to:

- a) Allocating and updating departure slots;
- b) Allocating and updating arrival slots;
- c) Allocating and updating en-route slots;
- d) Re-routing of traffic;
- e) Alternate flight profiles;
- f) Minutes-in-trail assignments;
- g) Mile-in-trail assignments;
- h) Airborne holding; and
- i) Ground holding.

1.5 Inherent in the provision of an ATFM service is the necessity to coordinate arrangements clearly and accurately between ATC units. In most instances this is achieved via voice coordination between operatives in the respective units, however many occasions also require written messaging to support implementation of ATFM operational initiatives. Accordingly, efficient and effective written and verbal communication using standardized and documented terminologies and phraseologies is essential.

2. General

2.1 The primary goal of this guidance material is to promulgate appropriate terminologies and phraseologies for the exchange of written and verbal ATFM messages between units providing ATFM services, both within States and between States. The terminologies and phraseologies contained herein are intended to reflect the current use of plain language and provide a basis for regional standardization and harmonization.

2.2 Although there are various plain language words and phrases in use today by ATFM service providers, these words and phrases are all capable of being organized into a modular and structured method of delivery to ensure the harmonization of communications and reduce the incidence of misunderstanding between units providing ATFM services.

2.3 It is not the intent of these guidelines to provide detailed information on ATFM concepts, procedures, and initiatives; however, since not all readers may be familiar with ATFM terms used in the examples, a brief description of ATFM operational initiatives is provided at **Appendix 1**. The list is not all-inclusive and does not preclude the innovation and application of other procedures that will result in improved ATFM services.

3. Modular and Structured ATFM messages

3.1 The use of a modular and structured ATFM message provides for consistent ATFM message design and delivery. Each component of the ATFM message can contain plain language elements that, when combined, provide a complete ATFM message. Harmonization is achieved by the delivery of an ATFM message that has all of the required components in a structured format while making allowances for different plain language elements. This is of particular benefit for ATFM service providers that use different ATFM terminology or for non-native English speaking ATFM service providers.

3.2 This guidance material promulgates the concept of modular and structured ATFM messages as the basis for written and verbal ATFM coordination and defines an ATFM message in terms of five modules – the “Who”, “What”, “Where”, “When” and “Why” of the ATFM communication. These five modules are described as follows:

- a) **Who**: The ATFM service unit being contacted followed by the ATFM service unit that is initiating the contact;
- b) **What**: The ATFM objective to be achieved;
- c) **Where**: The location of the ATFM objective to be achieved;
- d) **When**: The time and/or duration of the ATFM objective to be achieved; and
- e) **Why**: The reason for the ATFM objective.

3.3 There is no module regarding “How” the ATFM restrictions should be achieved by the counterpart ATFM service provider. This is because it is clearly the counterpart’s responsibility “how” they fulfill the ATFM restrictions within their airspace. However, the ATC unit being asked

to implement ATFM restrictions may collaborate with the originating ATC unit on the type and method of ATFM measure to be applied.

3.4 Generally speaking, ATFM service providers should resolve demand-capacity related constraints by initiating local and/or national ATFM initiatives first. Hence, ATFM operational initiatives will be requested by an adjacent international ATFM facility only when national measures are exhausted and therefore compliance should be considered highly necessary. Accordingly, once information is exchanged regarding an ATFM initiative and an action is agreed, application of the ATFM operational initiative is considered MANDATORY. Importantly, it should be noted that a critical situation at the receiving ATC unit could require imposition of an ATFM restriction without any option of non compliance by the transferring ATC unit.

3.5 Below are the examples of possible ATFM messages:

- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC ... REQUIRE 100 MILES IN TRAIL REGARDLESS OF FLIGHT LEVEL ON R220, R580 AND ALL PACOTS TRACKS FOR TRAFFIC LANDING NARITA ESTIMATING FIR BOUNDARY FROM 0100 UTC UNTIL 0500 UTC DUE TO SEVERE WEATHER”.
- “FUKUOKA ATMC, THIS IS FAA COMMAND CENTER... CAPACITY RESTRICTION: LOS ANGELES HAS STARTED FLOW RESTRICTIONS FOR ALL AIRCRAFT LANDING LOS ANGELES DUE TO EARTHQUAKE. LOS ANGELES APPROACH IS UNABLE TO ACCEPT INBOUND TRAFFIC UNTIL FURTHER NOTICE”.

4. ATFM Message Components

4.1 As the modular and structured ATFM message may contain several different elements of plain language, this section will examine each of the five components and detail some of the possible plain language words and phrases that are in use today.

The WHO Component

4.2 The ‘WHO’ component identifies the ATFM service unit being contacted followed by the ATFM service unit that is initiating the contact. ATFM units will be addressed by name until ICAO Annex 10 – *Aeronautical Telecommunications* is amended to incorporate appropriate ATFM unit identifiers. Examples of the ‘WHO’ component include:

- “FUKUOKA ATMC, THIS IS FAA COMMAND CENTER...”
- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC...”

The WHAT Component

4.3 The ‘WHAT’ component identifies the ATFM objective to be achieved. The ‘WHAT’ component may also be used to provide ATFM information. Objectives include, but are not limited to:

- “REQUIRE (number) MILES (or MINUTES) IN TRAIL AT THE SAME FLIGHT LEVEL”;

- “REQUEST (number) MILES (or MINUTES) IN TRAIL REGARDLESS OF FLIGHT LEVEL”;
- “REQUEST A RATE OF LESS THAN (number) AIRCRAFT PER HOUR”;
- “FLIGHT LEVELS (number) AND (number) NOT AVAILABLE”;
- “ONLY FLIGHT LEVELS (number), (number) AND (number) ARE AVAILABLE”;
- “(route/airport/airspace) NOT AVAILABLE DUE (reason) ALTERNATIVE[S] IS/ARE (routes/airports)”.

The WHERE Component

4.4 The ‘WHERE’ component represents the location of the ATFM objective to be achieved. It is often preceded by a modifying clause, indicating which aircraft or group of aircraft the restriction will apply to. The modifying clause and the location combination are used to construct the ‘WHERE’ component. Examples of which aircraft or group of aircraft are to be restricted include:

- “FOR ALL AIRCRAFT...”
- “FOR TRAFFIC FASTER THAN 300 KNOTS...”
- “FOR HEAVY AIRCRAFT...”
- “FOR TRAFFIC LANDING...”
- “FOR AIRCRAFT DEPARTING...”
- “FOR TRAFFIC OVERFLYING...”
- “FOR AIRCRAFT PASSING...”

4.5 Examples of location include:

- “AT NIPPI...”
- “ON A337...”
- “WESTBOUND ON PACOTS TRACK CHARLIE...”
- “INBOUND ON G344...”
- “ON PACOTS TRACK 2 LANDING SAN FRANCISCO AIRPORT...”
- “ABOVE FLIGHT LEVEL 300...”

4.6 In practice the modifying clause and the location are combined into one ATFM message, for example:

- “FOR ALL AIRCRAFT WESTBOUND ON PACOTS TRACK CHARLIE...”

The WHEN Component

4.7 The ‘WHEN’ component represents the time and/or duration of the ATFM objective to be achieved:

- “[FROM (time)] UNTIL (time)”.

4.8 Examples of time/duration include:

- “FROM 0300 UTC UNTIL 0600 UTC...”
- “FROM NOW UNTIL 0600 UTC...”

- “FROM 2300 UTC UNTIL FURTHER NOTICE...”
- “UNTIL FURTHER NOTICE...”

The WHY Component

4.9 The ‘WHY’ component represents the reason for the ATFM objective:

- “DUE TO (reason)”;
- “FOR (reason)”.

4.10 Examples of reasons include:

- “DUE TO RUNWAY CLOSURE”
- “FOR (SEVERE) WEATHER”
- “DUE TO COMMUNICATION FAILURE”
- “DUE TO (significant event/natural disturbance such as FIRE or VOLCANIC ASH)”
- “FOR STATE AIRCRAFT ACTIVITY”
- “DUE TO EQUIPMENT OUTAGE”
- “FOR EMERGENCY”
- “DUE TO ATFM INITIATIVES IN (location)”

5. ATFM Message Types

5.1 ATFM messages can be readily categorized by identifying the primary objective to be achieved by each type of message. This section describes a number of ATFM message types and their application in achieving particular objectives.

Messages containing information to be shared prior to commencing ATFM restrictions

5.2 ATFM related information-sharing should be facilitated not only during the actual flow control but also (and more importantly) well prior to invoking the ATFM restrictions when the possibility of flow control arises. The following phrases will make clear the distinction between the ATFM messages and the information provided for situational awareness:

- “POSSIBLE TRAFFIC FLOW RESTRICTIONS”;
- “CAPACITY RELATED INFORMATION”.

5.3 Examples of messages sent prior to invoking ATFM restrictions follow:

- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC... **POSSIBLE TRAFFIC FLOW RESTRICTIONS**... NARITA AIRPORT HAS CLOSED ONE RUNWAY AND STARTED SNOW REMOVAL”.
- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC... **CAPACITY RELATED INFORMATION**...NARITA AIRPORT HAS ENTERED THE STORM ZONE OF THE TYPHOON”.

ATFM Operational Initiative Messages

5.4 ATFM operational initiatives communicate air traffic flow restrictions/objectives from one air navigation service provider to another. They follow the five module structure described earlier:

- a) Who: The ATFM service unit being contacted followed by the ATFM service unit that is initiating the contact.
- b) What: The ATFM objective to be achieved.
- c) Where: The location of the ATFM objective to be achieved.
- d) When: The time and/or duration of the ATFM objective to be achieved.
- e) Why: The reason for the ATFM objective.

5.5 Examples of ATFM operational initiatives include:

- “FUKUOKA ATMC, THIS IS FAA COMMAND CENTER ... REQUIRE 30 MINUTES IN TRAIL AT THE SAME FLIGHT LEVEL FOR ALL AIRCRAFT LANDING CHICAGO FROM 0800 UTC UNTIL FURTHER NOTICE DUE TO STATE AIRCRAFT ACTIVITIES”.
- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC... FL350 AND BELOW NOT AVAILABLE FOR AIRCRAFT OVERFLYING JAPANESE DOMESTIC AIRSPACE UNTIL 0900 UTC DUE TO EMERGENCY”.

Reply to ATFM Operational Initiative Messages

5.6 The following phrases will be used for replying to ATFM initiative messages:

- “ACCEPT (operational initiative)”;
- “AGREED TO (operational initiative)”;
- “(operational initiative) IS ACCEPTABLE [DEPENDS ON THE DEMAND] (other pertinent information, if any)”;
- “UNABLE (operational initiative) [DUE (reason)] (alternative proposed)”.

5.7 Examples of replying to ATFM operational initiatives follow:

- “**AGREE TO** 30 MINUTES IN TRAIL AT THE SAME FLIGHT LEVEL ON PACOTS TRACKS 2 AND 3 FROM 1000 UTC UNTIL 1500 UTC”.
- “**UNABLE TO** ACCEPT THE RESTRICTION FROM 1430 UTC DUE TO TRAFFIC VOLUME ON A590 UNTIL 1530 UTC, **PROPOSE** COMMENCE RESTRICTION FROM 1530”.

Messages for the coordination of aircraft exempted from ATFM operational initiatives:

5.8 The following types of aircraft may be exempted from ATFM restrictions:

- a) Aircraft in a state of emergency
- b) Aircraft engaged in search and rescue missions
- c) Aircraft operating for humanitarian reasons
- d) Aircraft carrying the head of State or distinguished visitors of State
- e) Aircraft carrying a patient who needs urgent medical treatment

5.9 The following phrases will be used for the coordination of aircraft which are exempt from ATFM restrictions:

- “REQUEST EXEMPTION FROM ATFM FOR (aircraft identification) [DUE (reason)]”;
- “COORDINATION OF ATFM EXEMPTION FOR (aircraft identification) [DUE (reason)]”.

5.10 Examples of messages requesting ATFM exemption follow:

- “FUKUOKA ATMC, THIS IS FAA COMMAND CENTER... **REQUEST EXEMPTION FROM ATFM**...UAL123 DUE PATIENT WHO NEEDS URGENT MEDICAL TREATMENT”.
- “UAL123...EXEMPTION APPROVED”.
- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC... **COORDINATION OF ATFM EXEMPTION**... JA501A DUE OPERATING SEARCH AND RESCUE MISSIONS”.

Messages providing information for the next coordination

5.11 If it is possible and appropriate, the expected time of next coordination should be forwarded with the ATFM messages:

- “I WILL CALL YOU AT (time) FOR FURTHER COORDINATION”.

5.12 An example of a message with information for the next coordination follows:

- “FUKUOKA ATMC, THIS IS FAA COMMAND CENTER... REQUIRE 30 MINUTES IN TRAIL REGARDLESS OF FLIGHT LEVEL FOR ALL AIRCRAFT ON PACOTS TRACK 8 FROM 1000 UTC UNTIL FURTHER NOTICE DUE TO MILITARY ACTIVITY. **I WILL CALL YOU AGAIN AT 1100 UTC FOR FURTHER COORDINATION**”.

Amendment Messages

5.13 The amendment of an ATFM message should be structured in a similar way to the initial message and include similar elements but with additional modifiers. These modifiers may include:

- a) CHANGE
- b) AMEND
- c) REDUCE
- d) INCREASE
- e) DECREASE

5.14 Amendment messages should also identify which message is being amended, as several restrictions could be in place at one time. Examples of ATFM amendment messages include:

- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC... WE HAVE **CHANGED** THE RESTRICTION ON TRAFFIC FLYING PACOTS TRACKS CHARLIE, ECHO AND FOXTROT FOR NARITA AIRPORT. WE NOW NEED 20 MINUTES IN TRAIL AT THE SAME FLIGHT LEVEL ON PACOTS TRACKS CHARLIE, ECHO AND FOXTROT FOR TRAFFIC LANDING NARITA FROM NOW UNTIL 0900 UTC”.
- “FUKUOKA ATMC, THIS IS FAA COMMAND CENTER... WE HAVE **INCREASED** THE INBOUND RATE FROM 5 AIRCRAFT PER HOUR TO 10 AIRCRAFT PER HOUR FOR TRAFFIC BEYOND OAKLAND FIR UNTIL FURTHER NOTICE”.

Cancellation Messages

5.15 The cancellation of an ATFM message should be structured in a similar way to the initial message and include similar elements but also contain a canceling word or phrase. It is normally not necessary to state the reason for the cancellation. A canceling word or phrase may include:

- a) CANCEL
- b) RESUME
- c) RESUME NORMAL
- d) RELEASE

5.16 Cancellation messages should also identify which message is being cancelled, as several restrictions could be in place at one time. An example of an ATFM cancellation message follows:

- “FAA COMMAND CENTER, THIS IS FUKUOKA ATMC... **CANCEL** THE RESTRICTION ON TRAFFIC BEYOND THE FUKUOKA FIR AT THIS TIME. **RESUME NORMAL** TRAFFIC FLOW”.

6. Active Listening

6.1 Although written ATFM messaging is able to be read and re-read to ensure understanding, because of the variety of ATFM information that may be exchanged verbally and the inability to prescribe phraseologies for every situation that will be encountered, **active listening** is encouraged. Active listening is a structured form of listening and responding that focuses the attention on the speaker. The listener must take care to attend to the speaker fully, and then repeats, in the listener's own words, what he or she thinks the speaker has said. The listener does not have to agree with the speaker; he or she must simply state what they think the speaker said. This enables the speaker to find out whether the listener really understood. If the listener did not understand, the speaker can explain further. Once the speaker and listener are clear as to the message, the listener should respond with agreement, acceptance or disagreement.

6.2 Active listening has several benefits. First, it forces people to listen attentively to others. Second, it avoids misunderstandings, as people have to confirm that they do really understand what another person has said.

7. Abbreviations

7.1 **Appendix 2** provides a sample list of abbreviations used that are not defined in the ICAO Doc. 8400 (PANS-ABC). Neighboring ATFM facilities may wish to develop a similar list of abbreviations which are frequently used in ATFM communications, and include them in a letter of agreement.

Appendix 1

EXAMPLES OF AIR TRAFFIC FLOW MANAGEMENT OPERATIONAL INITIATIVES

The following list contains the ATFM operational initiatives presently utilized by the United States Federal Aviation Administration. The list is provided for example purposes, it is not all-inclusive and does not preclude the innovation and application of other procedures that will result in improved ATFM service delivery.

<u>Name</u>	<u>Description</u>
Airborne holding	Planned holding of aircraft may be utilized. This is normally done when the operating environment supports holding and the weather conditions are expected to improve shortly; this ensures aircraft are available to fill the capacity at the airport.
Altitude	Utilized to segregate different flows of traffic, or to distribute the number of aircraft requesting access to a specified geographic region. a) Capping: Term used to indicate aircraft will be cleared to an altitude lower than their requested altitude until they are clear of a particular airspace. Capping may apply to the initial segment of the flight or for the entire flight. b) Tunneling: Term used to indicate traffic will be descended prior to the normal descent point at the arrival airport to remain clear of an airspace situation; e.g., holding.
Fix balancing	Assigning an aircraft a fix other than that in the filed flight plan in the arrival or departure phase of flight to equitably distribute demand.
Ground delay programs (GDP)	Aircraft are held on the ground in order prior to departure to manage capacity and demand at a specific downstream location. The purpose of the program is to limit airborne holding.
Ground stops (GS)	GS is a process that requires aircraft that meet specific criteria to remain on the ground. Since this is one of the most restrictive methods of traffic management, alternative initiatives should be explored and implemented if appropriate. GSs should be used: - In severely reduced capacity situations (below most user arrival minimums, airport/runway closed for snow removal, or aircraft accidents/incidents); - To preclude extended periods of airborne holding; - To preclude sector/center reaching near saturation levels or airport grid lock; - In the event a facility is unable or partially unable to provide ATC services due to unforeseen circumstances; and - When routings are unavailable due to severe weather or catastrophic events.

Miles-in-trail (MIT)	The number of miles required between aircraft that meet a specific criteria. The criteria may be separation, airport, fix, altitude, sector, or route specific. MIT are used to apportion traffic into manageable flows, as well as to provide space for additional traffic (merging or departing) to enter the flow of traffic.
Minutes-in-trail (MINIT)	The number of minutes required between successive aircraft. It is normally used in a non-radar environment, or when transitioning to a non-radar environment, or when additional spacing is required due to aircraft deviating around weather.
Reroutes	Reroutes are ATC routings other than the filed flight plan. They are issued to: a) Ensure aircraft operate with the “flow” of traffic. b) Remain clear of special use airspace. c) Avoid congested airspace. d) Avoid areas of known weather where aircraft are deviating or refusing to fly.
Sequencing programs	These programs are designed to achieve a specified interval between aircraft; they may be software generated or determined by ATFM personnel. Different types of programs accommodate different phases of flight. a) Departure Sequencing Program (DSP): Assigns a departure time to achieve a constant flow of traffic over a common point. Normally, this involves departures from multiple airports. b) En route Sequencing Program (ESP): Assigns a departure time that will facilitate integration in the en route stream. c) Arrival Sequencing Program (ASP): Assigns fix crossing times to aircraft destined to the same airport.

Appendix 2

SAMPLE TABLE OF ABBREVIATIONS

The abbreviations listed here are those used by the FAA Command Centre (ATCSCC) and Fukuoka ATMC respectively that are not defined in the ICAO Doc. 8400 (PANS-ABC), and are provided only as examples. The shaded abbreviations are considered to be the common terms between the two centers.

ABBREVIATION	ATCSCC MEANING	ATMC MEANING
AAR	Airport Acceptance Rate	
ACID	Aircraft Identification	
ADL	Aggregate Demand List	
ADR	Airport Departure Rate	
ADZY	Advisory	
AIM	Aeronautical Information Manual	
ALTRV	Altitude Reservation	Altitude Reservation
ANP	Air Navigation Plan	
AOA	Office of the Administrator	
AOC	Airline Operations Center	
AP	Air Patrol	
APREQ	Approval Request	Approval Request
APVL	Approval	Approval
ARO	Airport Reservation Office	
ARTCC	Air Route Traffic Control Center	Air Route Traffic Control Center
ASM		Airspace Management
AT	Air Traffic	
ATCSCC	Air Traffic Control System Command Center	Air Traffic Control System Command Center
ATMC	Air Traffic Management Center	Air Traffic Management Center
ATMetC		Air Traffic Meteorological Center
ATO	Air Traffic Operations Program	
AUTODIN	Automatic Digital Network	
CARF	Central Altitude Reservation Function	
CCFP	Collaborative Convective Forecast Product	
CCWSU	Command Center Weather Service Unit	
CDM	Collaborative Decision Making	Collaborative Decision Making
CDR	Coded Departure Route(s)	Conditional Route
CDR	Continuous Data Recording	
CDT	Controlled Departure Time	

CFR	Code of Federal Regulations (formerly FAR)	
CIWS	Corridor Integrated Weather System	
COMSEC	Communications Security System	
CR	Collaborative Routing	
CT	Select Flights Ground Delay Program	
CTA	Controlled Time of Arrival	
CTAS-TMA	Center TRACON Automation System Traffic Management Advisor	
CVRS	Computerized Voice Reservation System	
CWA	Central Weather Advisory	
CWSU	Center Weather Service Unit	
DARC	Direct Access Radar Channel	
DCCWU	ATCSCC Weather Unit	
DOTS	Dynamic Ocean Track System	Dynamic Ocean Track System
DP	Departure Procedure	
DSP	Departure Sequencing Program	
EDCT	Expected Departure Clearance Time	Expected Departure Clearance Time
EFAS	Enroute Flight Advisory Service	
EFTO	Encrypt For Transmission Only	
EOF	Emergency Operations Facility	
EOR	Emergency Operations Room	
EPS	Engineered Performance Standards	
ESCAT	Emergency Security Control of Air Traffic	
ETE	Estimated Time Enroute	Estimated Time Enroute
ETMS	Enhanced Traffic Management System	
EUCARF	European Central Altitude Reservation Facility	
FA	General Ground Delay Program	
FAA	Federal Aviation Administration	Federal Aviation Administration
FADT	Fuel Advisory Delay Time	
FCA	Flow Constrained Area	
FDMS		Flight Data Management System
FDPS		Flight Data Processing Section
FEA	Flow Evaluation Area	
FP	Flight Plan	
FPL	Full Performance Level	
GA	General Aviation	
GAAP	General Aviation Airport Program	

GDP	Ground Delay Program	
GS	Ground Stop	
HARS	High Altitude Route System	
HDTA	High Density Traffic Airport	
IFCN	Interfacility Communication Network	
IFPPF	Individual Flight Plan From this Point	Individual Flight Plan From this Point
IFSS	International Flight Service Station	
INATS	Interruption of Air Traffic Service	
JCAB	Japan Civil Aviation Bureau	Japan Civil Aviation Bureau
LAA	Local Airport Advisory	
LADP	Local Airport Deicing Plan	
LOA	Letter of Agreement	Letter of Agreement
MAP	Monitor Alert Parameter	
MARSA	Military Assumes Responsibility for Separation of Aircraft	Military Assumes Responsibility for Separation of Aircraft
MEL	Minimum Equipment List	
MINIT	Minutes in Trail	
MIT	Miles in Trail	
MOS	Military Operations Specialist	
MTSAT	Multi-functional Transport Satellite	Multi-functional Transport Satellite
MVFR	Marginal Visual Flight Rules	
NADIN	National Airspace Data Interchange Network	
NAS	National Airspace System	
NAVAID	Navigational Aid	Navigation Aid
NFDC	National Flight Data Center	
NMCC	National Maintenance Coordination Center	
NOAA	National Oceanic and Atmospheric Administration	
NOM	National Operations Manager	
NOPAC	North Pacific	North Pacific
NOS	National Oceanographic Service	
NRP	National Route Program	
NTMO	National Traffic Management Officer	
NWS	National Weather Service	
OAG	Official Airline Guide	
ODP		Oceanic Air Traffic Control Data Processing System
OPSNET	Operations Network	

OTG		Oceanic Track Generator
OTR		Oceanic Transition Route
PACMARF	Pacific Military Altitude Reservation Facility	Pacific Military Altitude Reservation Function
PACOTS	Pacific Organized Track System	Pacific Organized Track System
PMTC	Pacific Missile Test Center	
PO	Plan of Operation	
Pref Route	Preferential Route	
PT	Planning Team	
RA	Route Advisory	
RAA	Remote Airport Advisory	
ROT	Runway Occupancy Time	
SAA	Special Activity Airspace	
SOP	Standard Operating Procedure	
STMP	Special Traffic Management Program	
SUA	Special Use Airspace	
SVRW	Severe Weather	
SWAP	Severe Weather Avoidance Program	
TEC	Tower-Enroute Control	
TELCON	Telephone Conference	
TFM	Traffic Flow Management	
TIS	Traffic Information System	
TMC	Traffic Management Coordinator	Traffic Management Coordinator
TMCIC	Traffic Management Coordinator in Charge	
TMI	Traffic Management Initiative	
TMU	Traffic Management Unit	Traffic Management Unit
TSTM	Thunderstorm	
WSO	Weather Service Office	

Asia/Pacific Region
Air Traffic Flow Management (ATFM) SURVEY

1. General

1.1 The objective of this survey is to obtain information in order to learn about the current status of ATFM in Asia/Pacific States and Organizations with respect to:

- a) The methods for estimating airport and ATC capacity;
- b) ATFM procedures for the following phases:
 - Airport strategic
 - Airport tactical
 - Airspace strategic
 - Airspace tactical
- c) Existing and planned equipment/infrastructure capable of supporting ATFM collaborative decision making (CDM), display and analysis; and
- d) related matters included meteorology, AIS and map aspects related to ATFM provision.

1.2 This information will be beneficial in enabling APANPIRG to fulfil its overall planning and harmonizing objectives. Accordingly, APANPIRG/20 (September 2009) adopted Conclusion 20/13 calling for the conduct of a regional ATFM survey during 2010

1.3 Mark with an “X” the corresponding answer. Please include your comments, if you deem pertinent. If necessary, use additional sheets. As applicable, send copies of requested electronic documents to the ICAO Asia/Pacific Regional Office icao_apac@bangkok.icao.int

1.4 Effective coordination with the relevant stakeholders should be made by the entity responsible for collating inputs for that State (i.e. ensure that a copy of this questionnaire has been sent to the State’s MET Authority as components of this survey depend on MET input and coordination with your MET Authority in obtaining input for the relevant sections of the survey may be necessary).

2. Airport Capacity

2.1 Does your administration (and/or State) currently have a method, whether basic or complex, for calculating airport capacity? If yes, please send an electronic copy of the methodology to icao_apac@bangkok.icao.int

☐ YES

☐ NO

2.2 If yes, please provide any available airport capacity data for your main airports in the following table. Please note that for this table:

Total Capacity = Airport Acceptance Rate (AAR) + Airport Departure Rate (ADR).

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Airport Name	Runway configuration	Airport Acceptance Rate (AAR)			Airport Departure Rate (ADR)	Total Capacity
		VFR	MVFR	IFR		

Table 1

Comments

3. En-route Sector Capacity

3.1 Does your administration (and/or State) currently have a method, whether basic or complex, for calculating enroute sector capacity? If yes, please send an electronic copy of the methodology to icao_apac@bangkok.icao.int

☐

YES

☐

NO

3.2 If yes, please provide any available airport capacity data for your main airports in the following table. Under the “Time Increments” column, please indicate if the sector capacity is computed by 15-minute increments, 60-minute increments, or some other increment.

ACC	Sector Name	Sector Altitudes	Sector Capacity	Time Increments

Table 2

Comments

4. Procedures for Phases of ATFM

4.1 Does your administration (and/or State) currently have procedures/arrangements in place to support the following phases of ATFM?

a) Airport Strategic

☐ YES

☐ NO

b) Airport Tactical

☐ YES

☐ NO

c) Airspace Strategic

☐ YES

☐ NO

d) Airspace Tactical

☐ YES

☐ NO

Comments

5. Flow Management Data Processing and Display

5.1 Does your administration (and/or State) have a system to receive, process, and display flight plan data (FPL, RPL, etc.)?

☐ YES

☐ NO

5.2 Does your administration (and/or State) have a database that includes airspace information (for example, ACC boundary coordinates, sector boundary coordinates, NAVAIDS, airways, special use airspace) and airport information (for example, runway and taxiway layout, ramp layout, parking gate information)?

☐ YES

☐ NO

5.3 Does your administration (and/or State) have an electronic ATFM system that displays airborne traffic?

☐ YES

☐ NO

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5.4 Does your administration (and/or State) have a communication system that allows automated or manual exchange of messages to support ATFM decision making (for example, SLOT assignment messages, SLOT adjustment messages, delay reporting messages, alternate route messages)?

☐ YES

☐ NO

5.5 Does your administration (and/or State) have a system to monitor and display the airport acceptance rates (AAR) at the main airports?

☐ YES

☐ NO

5.6 Does your administration (and/or State) have a system to monitor and display enroute sector capacity?

☐ YES

☐ NO

5.7 Does your administration (and/or State) have a system to monitor and display the mix of aircraft using the airspace or airports?

☐ YES

☐ NO

6. Surveillance Systems for ATFM Support

6.1 In the following table, list the type of surveillance systems in use in your administration's (and/or State's) airspace structure.

ACC Surveillance System	TMA Surveillance System	Other Surveillance System

Table 3

7. AIS/Map for ATFM Support

7.1 On the following lines, list the AIS and map databases that your administration (and/or State) has available to support ATFM.

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7.2 Are they available in an electronic format?

☐

YES

☐

NO

7.3 What is the routine AIS database update cycle?

☐

28-DAY UPDATE

☐

56-DAY UPDATE

☐

OTHER

8. Meteorological Information

8.1 Provide the specific meteorological products and/or websites that your administration (and/or State) has available to support ATFM by checking the appropriate box.

☐TAF; ☐Trend; ☐METAR; ☐Local Report;

☐Real-time Sensor Data (e.g. RVR); ☐Weather Radar; ☐Satellite Imagery;

☐Surface Analysis Charts; ☐Surface Prognosis Charts; ☐SIGWX Chart;

☐Wind/temperature forecast Charts; ☐GRIB data (wind & temperature forecasts);

☐SIGMET; ☐Aerodrome warnings, wind shear warnings and alerts;

☐VA/TC Advisories; ☐Weather Briefing; ☐Others (please elaborate):

8.2 List the MET products your facility considers operationally valuable (in order of most importance) to AFTM.

8.3 List the MET products your facility considers operationally insignificant (in order of least importance) to AFTM.

8.4 Does your facility use automated processes of gridded data?

8.5 If no to 8.4, does your facility plan to implement automated processes of gridded data (if yes, please indicated approximate date)?

9. Data for Historical and Statistical Analysis

9.1 On the following lines, list the type of databases (i.e. aircraft position data from ADS-B/radar, OPMET data, weather radar data...) your administration (and/or State) maintains to support the analysis of air traffic operations and meteorological activities.

10. Communications capabilities for Collaborative Decision Making in ATFM

10.1 List the types of communication systems (i.e. AFTN, Internet, dedicated data link, video/tele-conferencing...) your operational units already have or could straightforwardly have with:

(a) other centralized ATFM organizations

(b) other ATS units and/or Flight Management Units

(c) operators and airspace users

(d) airport authorities

(e) meteorological authorities and/or aeronautical MET services

☐ tick box if AFTM has a specialized meteorological support service

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(f) aeronautical information services

(g) the transmission of radar and ADS data to the ATFM center

- END -

Terms of Reference

Southeast Asia Route Review Task Force **(RR/TF)**

- 1) The objective of the ICAO RR/TF is:

In collaboration with affected stakeholders and ensuring inter-regional harmonization, develop and implement strategic, benefits-driven plans to improve en-route airspace efficiency.

- 2) To meet this objective the Task Force shall:

- a) Review the existing route structures in the WPAC/SCS area south of the Fukuoka FIR, taking into consideration the AR9 traffic flow.
- b) Determine the reduced horizontal separation required, taking into account the aircraft approval status of the traffic operating on the relevant route.
- c) Examine the possibility of a step-by-step or phased implementation of new route structure and detail the phases required and the areas/routes concerned.
- d) Develop and action the necessary strategic plans with appropriate timelines to implement the new route structure based on the APANPIRG Regional PBN Implementation Plan and ICAO Standards and Recommended Practices, whilst taking into account the need for inter-regional harmonization, State and user requirements.
- e) Ensure the conduct of Annex 11 compliant pre-implementation safety assessments and make arrangements for States to conduct ongoing post-implementation safety monitoring in accordance with ICAO provisions.
- f) Consider setting up appropriate teams/groups which might but not necessarily, include the entire Task Force, to address and implement specific agreed measures within specific airspaces.
- g) Cooperate with other Task Forces and groups which are involved with similar work in adjacent airspaces in order to achieve harmonized inter-regional solutions.
- h) Explore possibilities for further enhancements to operational efficiency of route structures through reconfiguration and/or enhanced surveillance.

- 3) Membership of the RR/TF should include, but not be limited to: Cambodia, China (for Sanya FIR), Hong Kong China, Indonesia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Vietnam and IATA.

- 4) The RR/TF reports to the ATM/AIS/SAR Sub Group of APANPIRG

(last amended ATM/AIS/SAR/SG/19, 26 June 2009)

STATE SAR AGREEMENTS

(last updated 11 September 2009)

ID NO.	DATE	STATES	REMARKS
1	14 April 1972	ASEAN States - Indonesia, Malaysia, Philippines, Singapore and Thailand	Multilateral agreement for the facilitation of search for aircraft in distress and rescue of survivors of aircraft accidents
2	March 1997	Viet Nam - ASEAN	Viet Nam signed instrument of accession to 1972 ASEAN Agreement (as above)
3	June 1982	Indonesia / Singapore	
4	11 August 1984	Malaysia / Singapore	
5	29 August 1985	Malaysia / Indonesia	
6	September 1985	Singapore / Thailand	Updated July 1996
7	9 September 1985	Malaysia / Thailand	
8	9 December 1985	Malaysia / Philippines	
9	August 1986	Indonesia / Philippines	
10	1986	United States / Japan	
11	1988	United States / Indonesia	
12	1990	Indonesia / Papua New Guinea	JBC MOU signed
13	November 1990	Australia / Indonesia	Updated 5 April 2004
14	July 1996	Philippines / Singapore	
15	July 1996	Viet Nam / Singapore	
16	September 1996	Viet Nam / Philippines	
17	16 December 1998	Malaysia / Brunei Darussalam	
18	1998	Lao PDR / Vietnam	LOA for provision of assistance
19	February 1999	Cambodia / Viet Nam	
20	February 2001	Australia / Papua New Guinea	
21	September 2002	New Caledonia / New Zealand	
22	November 2002	United States / Republic of	

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ID NO.	DATE	STATES	REMARKS
		Palau	
23	2003	United States / New Zealand	
24	notified 2003	United States / Marshall Islands	
25	notified 2003	United States / Micronesia	
26	notified 2003	United States / China	
27	June 2005	Tonga / New Zealand	
28	notified 2005	New Zealand / Australia	
29	notified 2005	New Zealand / Samoa	
30	April 2006	Australia / Maldives	Letter of Arrangement
31	notified July 2006	Indonesia / United States	Agreement on the Coordination of SAR Services
32	notified July 2007	New Zealand / Cook Islands,	
33	notified July 2007	New Zealand/Chile	Final draft agreement being considered by authorities in Chile
34	notified July 2007	New Zealand/Niue	No requirement for separate SAR agreement, covered under Government to Government aid agreement
35	notified July 2007	New Zealand/Tahiti French Polynesia	Final draft agreement being considered by authorities in Tahiti
36	notified July 2007	New Zealand/Tokelau	No requirement for separate SAR agreement, covered under Government to Government aid agreement
37	16 May 2007	Republic of Korea/China	
38	30 April 2008	Republic of Korea/Japan	
39	March 2009	Viet Nam/Lao PDR	SAR Agreement
40	March 2009	Viet Nam/Cambodia	SAR Agreement
41	1 June 2009	New Zealand/Chile	Arrangement for coordination of SAR services

Note: ATM/AIS/SAR/SG/18 re-ordered the List by date, any additional updated entries by APANPIRG/20 in bold type.

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Analysis of SAR Capability of ICAO States in the ASIA/PAC Region

	Training	Alerting	SAR committee	Agreements	Relationships	Communications	Quality Control	Civil/Military	Resources	SAREX	Library	Computerisation	SAR programme	Special equipment	SAR aircraft	Navigation	Cospas-Sarsat	Distress	ELTs
Afghanistan																			
Australia	E	E	E	E	E	C	E	E	E	E	E	E	E	E	E	E	E	C	E
Bangladesh	B	C	D	A	A	C	C	A	D	A	A	C	A	A	C	C	D	A	C
Bhutan																			
Brunei	E	E	E	E	E	E	E	E	E	E	E	E	E	E	D	D	E	E	A
Cambodia	D	D	C	D	C	D	C	A	D	C	C	C	B	C	A	A	B	B	D
China	E	E	E	E	E	E	D	D	E	D	D	C	B	A	E	E	E	E	A
Cook Islands	A	B	B	A	A	C	C	C	B	A	B	A	A	A	A	B	B	A	A
DPR Korea	B	D	B	D	A	B	D	D	D	C	B	A	A	A	B	A	C	C	A
Fiji	B	C	C	C	C	C	C	B	D	C	D	C	A	C	B	A	C	C	A
French Polynesia	C	D	D	D	C	D	E	A	E	C	C	B	A	A	E	D	E	E	A
Hong Kong, China	E	E	E	E	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E
India	D	C	C	B	B	C	C	A	C	C	C	C	C	D	D	D	C	A	E
Indonesia	E	D	E	E	E	D	D	D	E	D	E	D	D	D	C	D	D	D	E
Japan	E	E	E	E	D	E	E	E	E	E	E	E	D	E	E	E	E	E	E
Kiribati																			
Lao PDR	B	A	B	B	B	A	B	A	B	B	A	C	A	A	A	A	A	A	A
Macau, China	E					E	E				E					E			
Malaysia	E	E	C	E	D	E	E	E	E	E	E	D	E	E	E	D	E	E	B
Maldives	B	A	A	A	A	A	A	A	D	A	C	A	A	A	A	A	A	A	A
Marshall Islands																			
Micronesia	C	B		A	A	B	C					A		B	B				
Mongolia	A	C	C	A	B	B	B	A	B	B	B	C	B	B	A	A	A	B	A
Myanmar	B	A	B	C	A	D	C	C	D	A	A	A	A	A	C	A	D	C	A
Nauru																			
Nepal	D	D	C	B	A	C	C	B	D	B	A	B	A	D	D	C	D	D	B
New Caledonia	C	D	D	D	C	D	E	A	E	C	C	B	A	A	E	D	E	E	E
New Zealand	E	E	E	E	A	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Pakistan	C	C	D	D	A	D	D	C	D	C	A	A	A	A	D	A	D	D	E
Palau																			
Papua New Guinea	D	E	D	C	D	D	C	C	D	C	C	D	C	C	C	A	A	A	A
Philippines	D	C	E	D	D	C	D	D	E	C	C	C	C	C	C	B	C	E	A
Rep. of Korea	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Samoa																			
Solomon Islands																			
Singapore	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Sri Lanka	D	A	C	D	B	C	C	D	E	D	B	C	A	A	D	D	C	A	A
Thailand	E	E	E	E	D	E	E	E	E	E	E	D	D	D	E	E	E	E	E
Timor Leste																			
Tonga	C	B	A	A	B	C	C	A	D	A	A	A	A	A	A	A	C	A	A
United States	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Vanuatu																			
Viet Nam	D	D	D	E	D	D	D	C	E	D	C	C	B	C	C	D	D	C	D

(Last updated 11 September 2009)

Categorisations:

A = Not implemented	D = Meets Annex 12 requirements in most areas
B = Initial implementation	E = Fully meets Annex 12 requirements
C = Meets Annex 12 requirements in some areas	Blank = No response

APANPIRG State SAR Capability Matrix

Guidance to complete the Matrix

- 1. Training**
 - o The appropriate level and type of training for SAR coordinator, SAR mission coordinator, on-scene coordinator, and operational facilities. (IAMSAR Manual Vol. 1, Chapter 3)
- 2. Alerting**
 - o Fast and reliable means for the rescue coordination center to receive distress alerts. (IAMSAR Manual Vol. 1, Chapter 2)
- 3. Legislative**
 - o Statutes and related provisions that establish a legal foundation for establishing a SAR organization and its resources, policies, and procedures. (IAMSAR Manual Vol. I, Chapter 1)
- 4. SAR committee**
 - o Typically established under a national SAR plan, the SAR coordinating committee is comprised of SAR system stakeholders. (IAMSAR Manual Vol. 1, Chapter 6 and Appendix J)
- 5. Agreements**
 - o States should enter into agreements with neighboring States to strengthen SAR cooperation and coordination. (Chapter 3 – *Cooperation*, in both Annex 12 – Search and Rescue, and the International Convention on Maritime SAR)
- 6. Relationships**
 - o Close cooperation between services and organizations which may contribute to improving SAR service in areas such as operations, planning, training, exercises and research and development.
- 7. Communications**
 - o Communication capability for receipt of distress alerts and operational coordination among the SAR mission coordinator, the on-scene coordinator and SAR facilities. (IAMSAR Manual Vol. 1, Chapter 3)
- 8. Quality Control**
 - o Procedures to focus on improving the quality of SAR services so as to improve results and reduce costs. (IAMSAR Manual Vol. 1, Chapter 6)
- 9. Civil/Military**
 - o Close cooperation between the various civilian and military organizations.
- 10. Resources**
 - o The primary operational facilities made available to the national SAR system by various authorities and arrangements with others. (IAMSAR Manual Vol. 1, Chapter 5 and Appendix C)

11. SAR Exercise

- o Exercise to test and improve operational plans, provide learning experience and improve liaison and coordination skills. (IAMSAR Manual Vol. 1, Chapter 3; Annex 12, and Annex 14 regarding Airport Emergency Plan)

12. Library

- o Quick access to the applicable international, national, and agency SAR publications that provide standards, policy, procedures and guidance.

13. Computerization

- o Use of or access to output of various computer resources including databases, computer aids for SAR system management, search planning software, etc. (IAMSAR Manual Vol. 1, Chapter 2)

14. SAR programme

- o National structure to establish, manage and support the provision and coordination of SAR services. (IAMSAR Manual Vol. 1, Chapter 1)

15. Supply dropping

- o Supplies and survival equipment carried by air and maritime SAR facilities to aid survivors and facilitate their rescue, as appropriate. (IAMSAR Manual Vol. 1, Chapter 2 and Appendix B)

16. Special equipment

- o Equipment created for specific rescue scenarios (such as mountain or desert rescue) and equipment typically carried on designated SAR units to support coordination and locating functions as well as special supplies and survival equipment to aid survivors and facilitate their rescue. (IAMSAR Manual Vol. 1, Chapter 2 and 4)

17. SAR aircraft

- o An aircraft provided with specialized equipment suitable for the efficient conduct of SAR missions (Annex 12, Chapter 2 - *Organization*)

18. Navigation

- o Suitable means provided within the SAR region to determine position, and the responding SAR facilities have the appropriate equipment on board to determine their position in the SAR region they are likely to operate. (IAMSAR Manual Vol. 1, Chapter 2)

19. Emergency Locator Transmitter (ELT)

- o National regulations for carriage of ELTs, and arrangements for registration of the 406 MHz beacon and rapid access to the beacon registration database. (Annex 6 – Operation of Aircraft and Annex 10 - Aeronautical Telecommunications; and IAMSAR Manual Vol. 1, Chapter 4)

20. Cospas-Sarsat Distress Alerts

- o A SAR Point of Contact (SPOC) designated for receipt of Cospas-Sarsat distress data, and arrangements for efficient routing of the distress data to the appropriate SAR authority (the aeronautical emergency locator transmitter ELT), maritime emergency position-indicating beacon (EPIRB), and personal locator beacon (PLB)). (Annex 12, paragraph 3.2.5 and Section 2.4; and, IAMSAR Manual Vol. 1, Chapter 4)

Search Planning for Audible 121.5 MHz Distress Beacon Alerts

1. Search planning for audible 121.5 MHz beacon alerts will most often result from reports received from commercial aircraft flying at high altitude. These reports will result in relatively large areas for the possible location of the beacons. The methods that follow will help reduce those areas and provide search options. These same methods apply equally to audible alerts from low-flying aircraft, general aviation, and surface radio reception of 121.5 MHz beacon alerts.
2. Figure 1 depicts the Geometry for a typical case where a reporting aircraft passes within reception range of beacon signal. It is provided as a visual and labeling reference for employing the planning methods that follow.

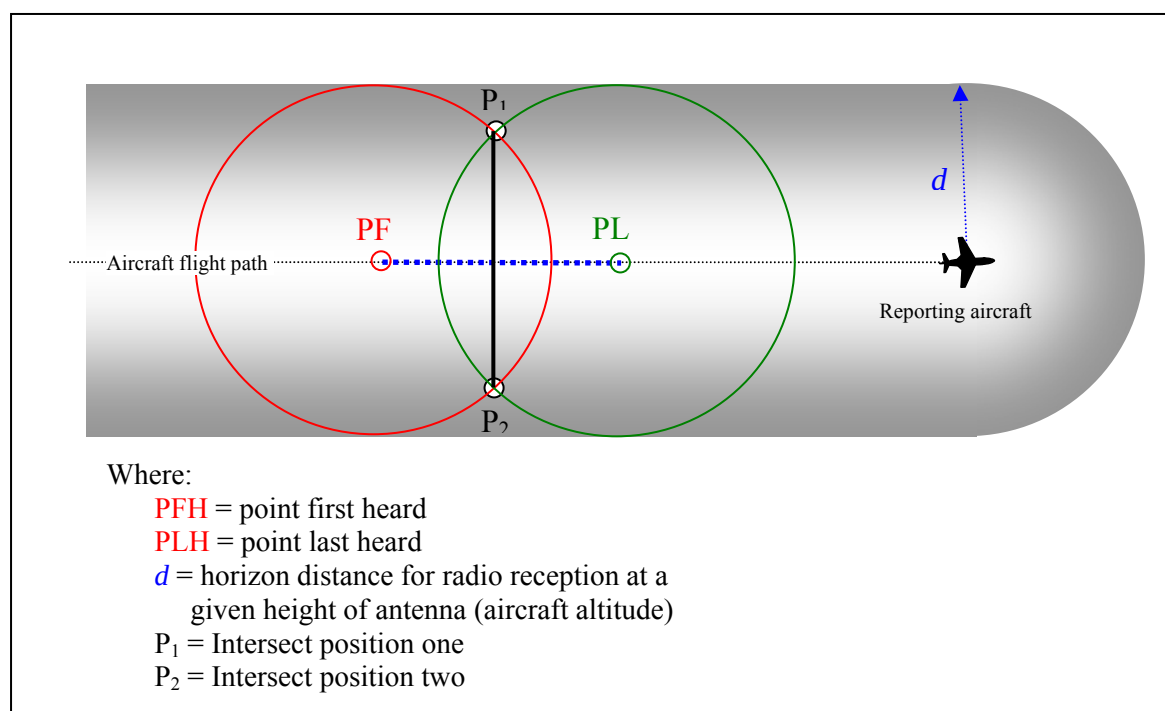


Figure 1 Audible Beacon Alert; Geometry for typical case where reporting aircraft passes within reception range of beacon signal

3. **Record 121.5 report data** in the following table. Although all the information is important and aids in refinement of the possible location of the beacon, the minimum information required to determining a probable area for the reported beacon is the position and antenna height for points first heard (PFH) and last heard (PLH).

Table 1 121.5 MHz Beacon Alert report data

Point	Date-Time	Position (lat/long)	Aircraft Altitude (h) (ft)	Course (degrees true)	Speed over ground (kts)
PFH (first heard)		N/S E/W			
PLH (last heard)		N/S E/W			

4. **Plot the line corresponding to the track of the aircraft.** Use either rhumb line or great circle navigation depending on the track being followed by the reporting aircraft.

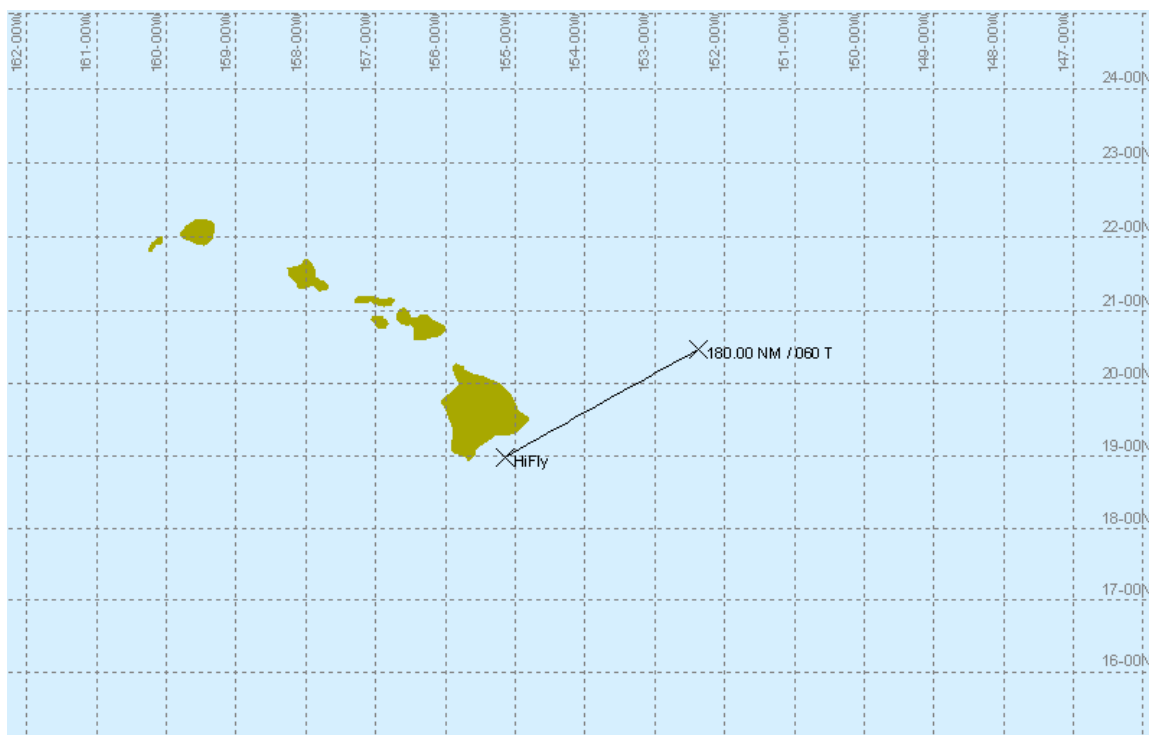


Figure 2 Plot of PFH & PLH

5. **Compute and plot the distance to the radio (VHF/UHF) horizon (d) for the reporting aircraft at PFH & PLH.**

- a. The horizon distance is estimated using the following equation:

$$d = 1.23 \times \sqrt{h}$$

Where:

h is the antenna height above the water (e.g., mean sea level) in feet, and

d is the Horizon Distance (reception range) for the reporting aircraft in nautical miles (nm).

- b. Record the results in the following table.

Table 2 Radio horizon distance

Point	Aircraft Altitude (h) (ft)	Radio Horizon Distance (d) (nm)
PFH		
PLH		

- c. Draw circles centered on the PFH and PLH with a radius equal to the computed radio horizon distance for each point at the given altitude for each as recorded in Table 2 (shown in Figure 3).

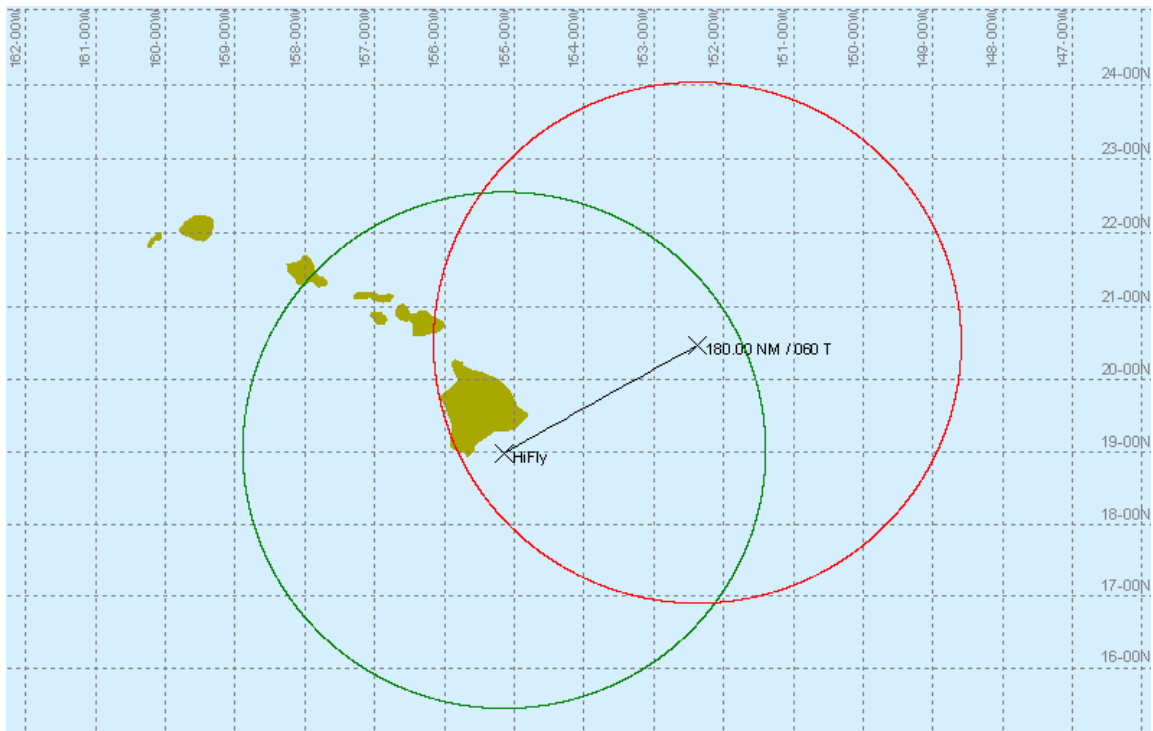


Figure 3 Plot of computed radio horizon distances for PFH & PLH

6. **Plot the intersect line.** The two circles should intersect in two places. Draw a line between the two points where the circles intersect. This line will bisect the line connecting PFH and PLH positions.

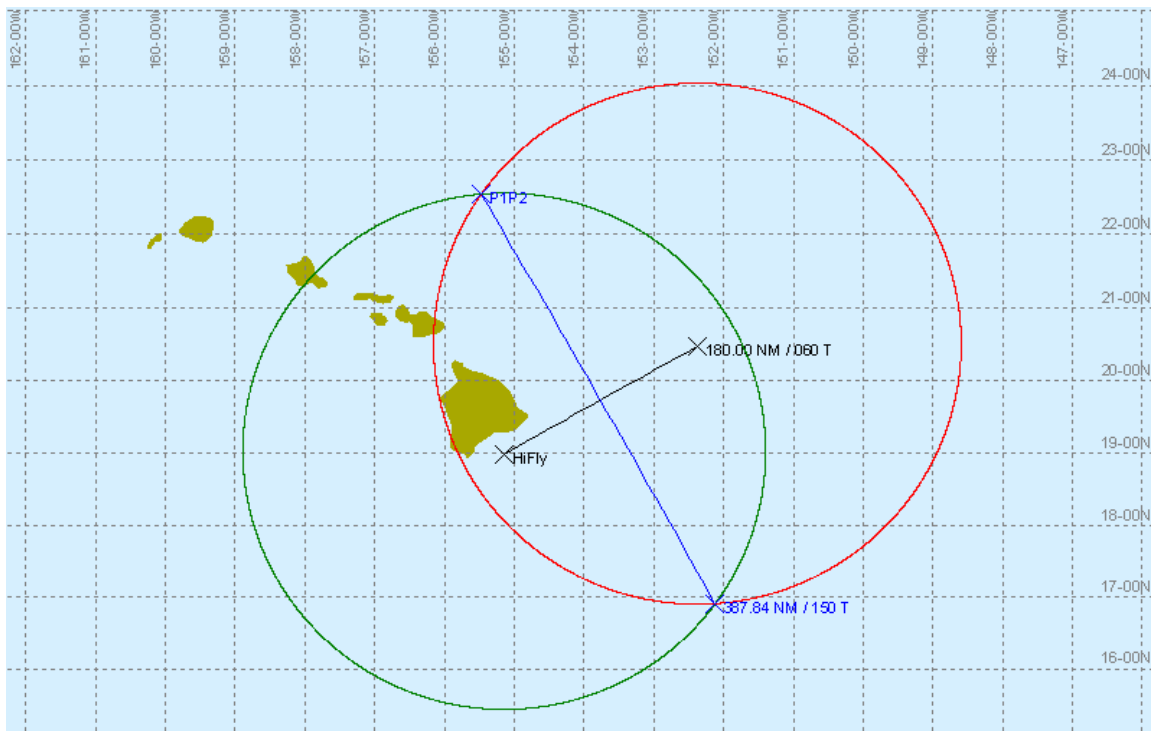


Figure 4 Plot of the intersect line

7. **Determining Search Areas based on a Single Report.** With only a single report from a high-flying aircraft and the associated long distances, large search areas will result and search options will be limited.
- a. Generally, with a single report only an electronic search may be possible to attempt to reacquire the beacon and then use radio direction finding capabilities to home in on the signal. The electronic search may be accomplished reasonable quickly with a single track search under most circumstances.
 - b. If an aircraft SAR unit (SRU) is deployed, it should proceed to the nearest point where the two circles intersect and then fly to the other point where the two circles intersect at a high altitude. An example of this method is illustrated in Figure 5. This should bring it closer to the beacon. Once the beacon is acquired, the SAR unit can home on it until located.

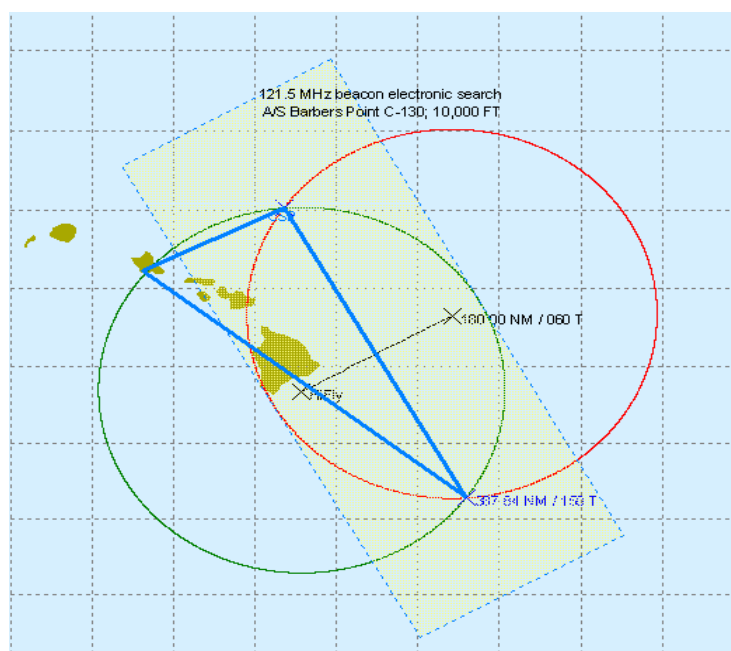


Figure 5 Aircraft SRU search down the intersect line at an altitude of 10,000 feet with a radio horizon range of 123 nm.

- c. If necessary, a multi-leg track line pattern may be used to cover the area contained in the intersection of the two circles. This might be necessary if the maximum altitude of the SRU limits its maximum detection range to a value significantly smaller than one-half the maximum width of the intersection of the two circles. A similar PS search could also be used.
8. **Special case: flying directly over a beacon.** A special case occurs when the reporting aircraft passes directly over or nearly over the beacon position as shown in Figure 6. When this occurs, the search aircraft may effectively proceed down the same trackline as the reporting aircraft. This special case is indicated when the distance over which the beacon was heard is twice (or nearly so) the calculated radio horizon distance (*d*) for the reporting aircraft's altitude.
9. **When not to Search along the reporting aircraft's trackline.** In most cases the reporting aircraft will not pass directly or nearly directly over the beacon which will preclude the search aircraft from merely proceeding down the same trackline to conduct an electronic search if the search aircraft altitude is significantly lower than the reporting aircraft altitude.
- a. As shown in Figure 7 the reduced reception range at the lower altitude for the search aircraft may indeed result in the signal being missed. The example for a beacon heard off Hawaii shows this. With the reporting aircraft at 30,000 feet and the search aircraft at 10,000 feet the

two primary locations would be missed by a search down the reporting aircraft's track as shown in figure 8. For this particular case, even searching at 20,000 feet the radio horizon for the search aircraft would not encompass the entire area.

- b. The preferred alternative in most situations is to conduct the search along the intersect as detailed in paragraph 7, shown in Figure 9, and practically demonstrated in Figure 5; again with the reporting aircraft at 30,000 feet and search aircraft at 10,000 feet.
- c. If the search along both the track and perpendicular to the track will not work, a multiple leg track search may have to be used. In those situations, the search duration may make the search unreasonable and lacking corroborating information or additional reports, a decision on whether to search or not may be necessary.

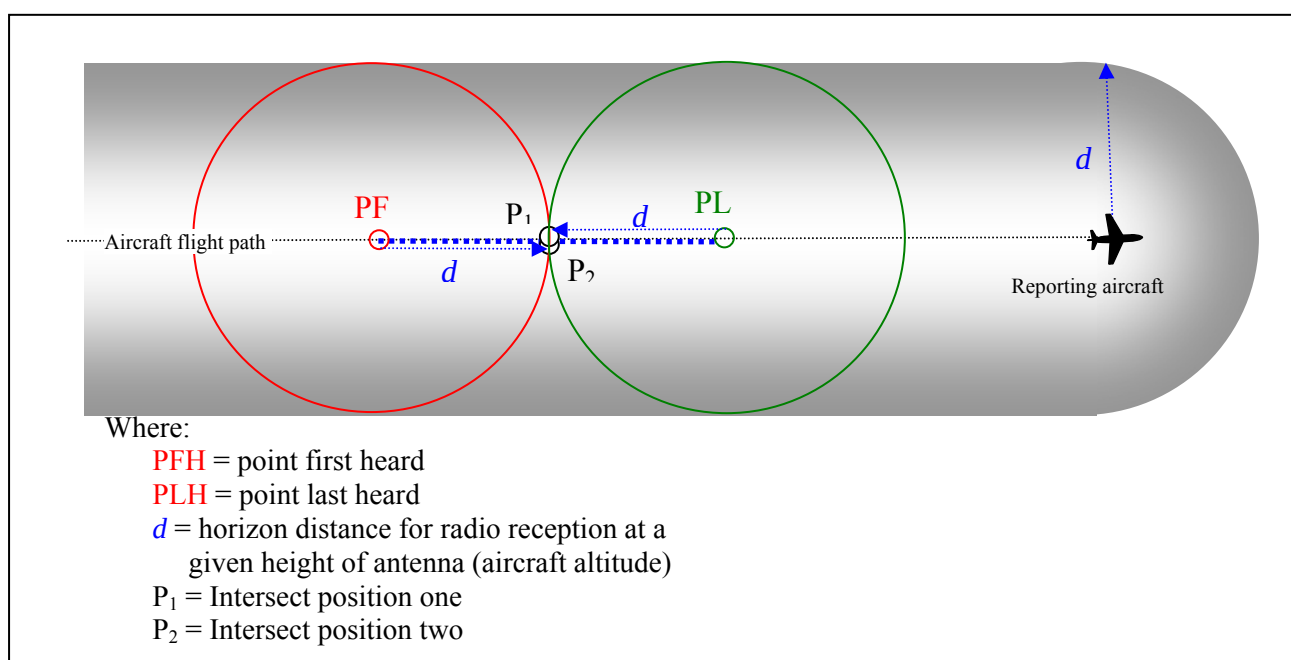


Figure 6 Audible Beacon Alert; Basic geometry for special case where reporting aircraft passes directly over the beacon position

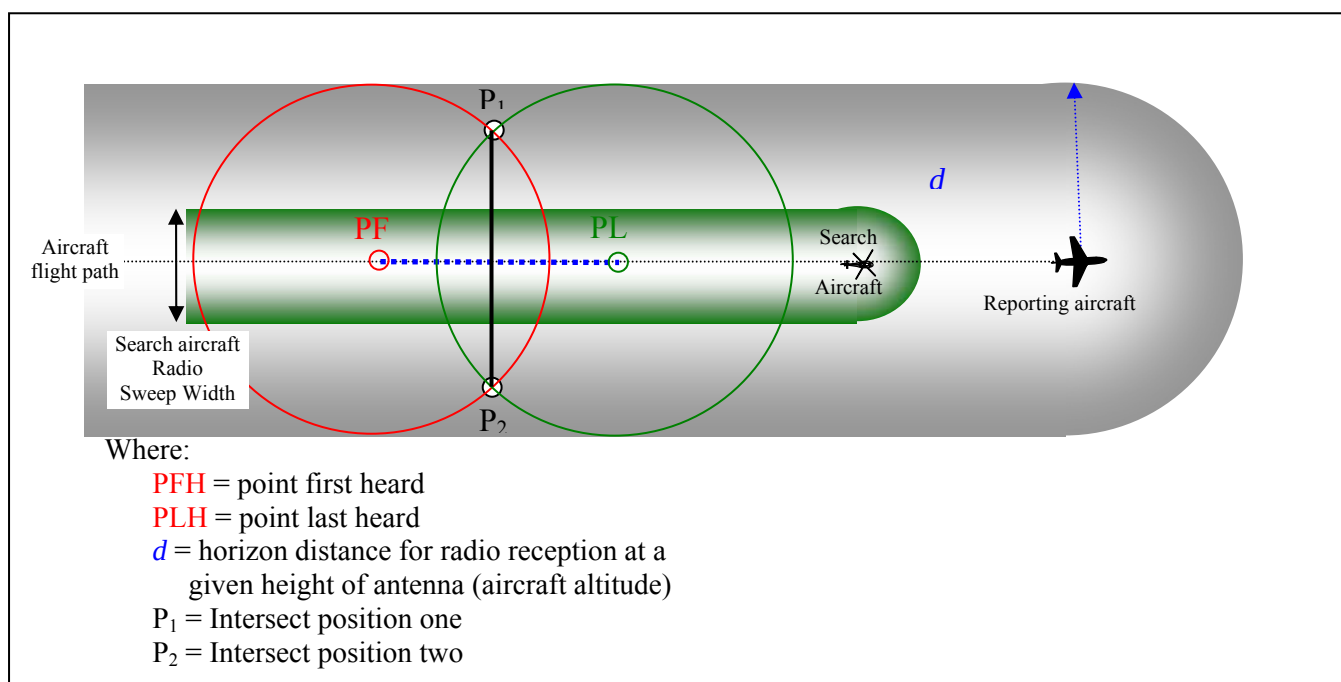


Figure 7 Search aircraft at lower altitude than reporting aircraft – same track; beacon signal not heard

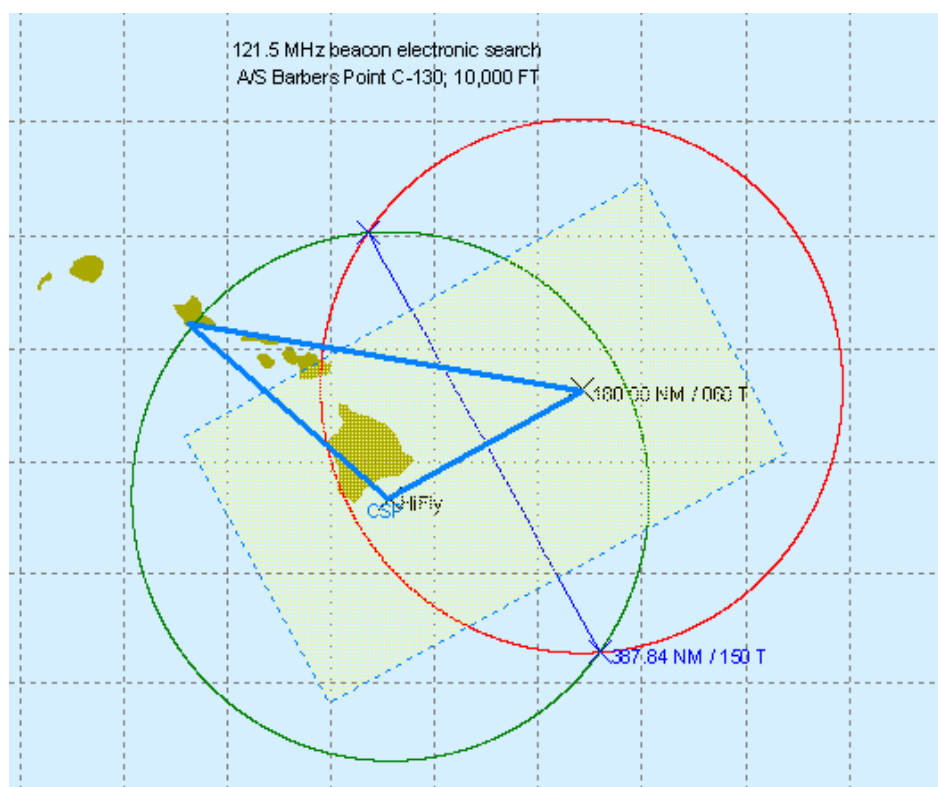


Figure 8 Search aircraft at 10,000 feet, reporting aircraft at 30,000 feet – same track; beacon signal not heard

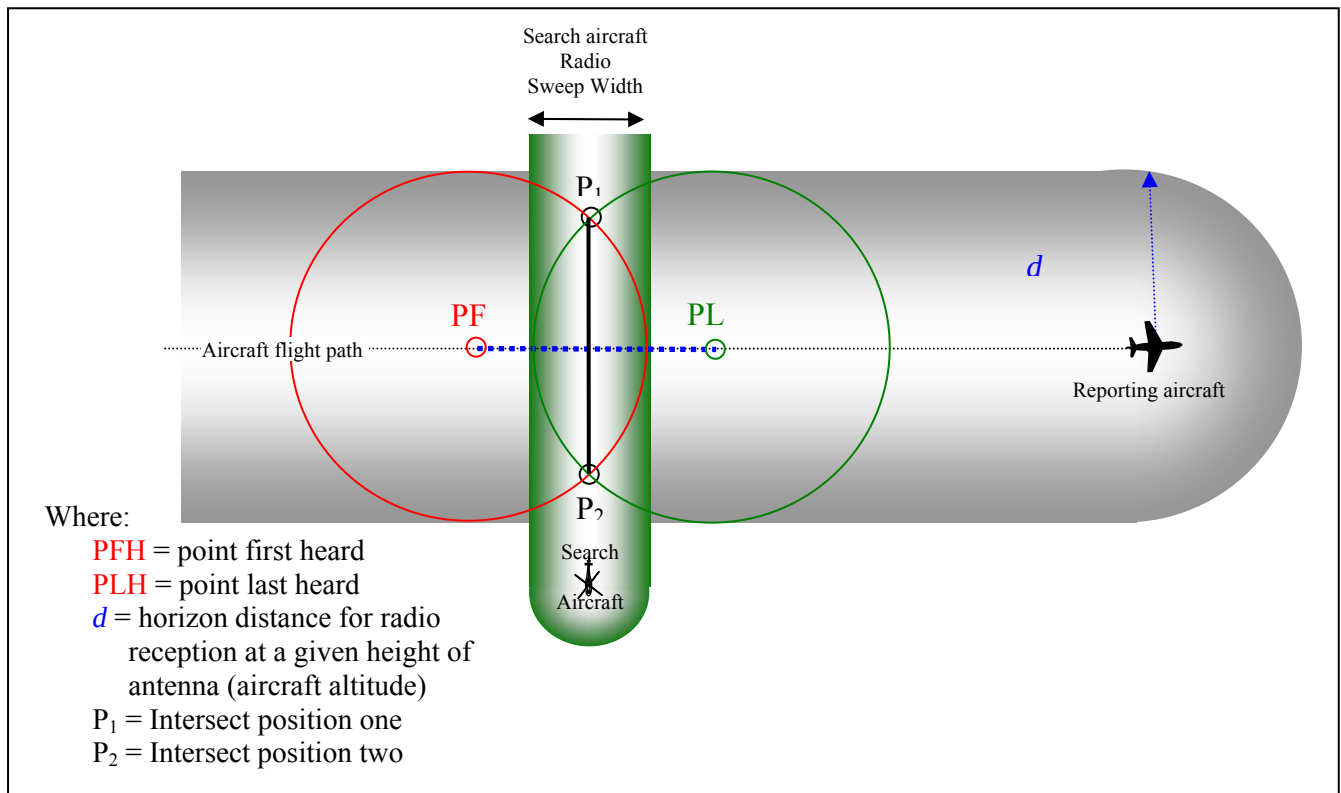


Figure 9 Searching the intersect line by search aircraft at lower altitude than the reporting aircraft.

10. **Visual search.** If no beacon signal is detected either by the search aircraft conducting an electronic search or by other high-flying aircraft, then only rarely will a visual search be possible based on a single report.
 - a. A visual search may be conducted when the original report comes from a low-flying aircraft which narrows the possible search area significantly.
 - b. When a visual search is conducted based on an audible 121.5 MHz beacon alert, the agency policies and procedures for searches on uncorrelated distress alerts should be followed.
11. **Determining Search Areas with Multiple Reports.** Multiple reports greatly simplify determining the probable location of a distress beacon. This situation is very similar to uncorrelated distress calls on VHF-FM and the reception by multiple towers (without DF).
 - a. Use the methods provided above for plotting each of the reports.
 - b. Then identify the areas of overlap and intersections of respective pairs of radio horizon rings as possible locations and eliminate those areas not covered by the multiple reports.
 - c. Figure 10 shows an example plot of two aircraft reports and resulting intersecting reception range rings.
 - (1) Hifly is at 30,000 feet and on a course of 060 deg T.
 - (2) Hifly2 is initially at 20,000 feet and descending, the point last heard is at 10,000 feet. Hifly2 is on a course of 242 deg T.
 - d. The smaller search area presented in this case would greatly reduce the search time needed for an electronic search and likely result in a reasonable visual search.

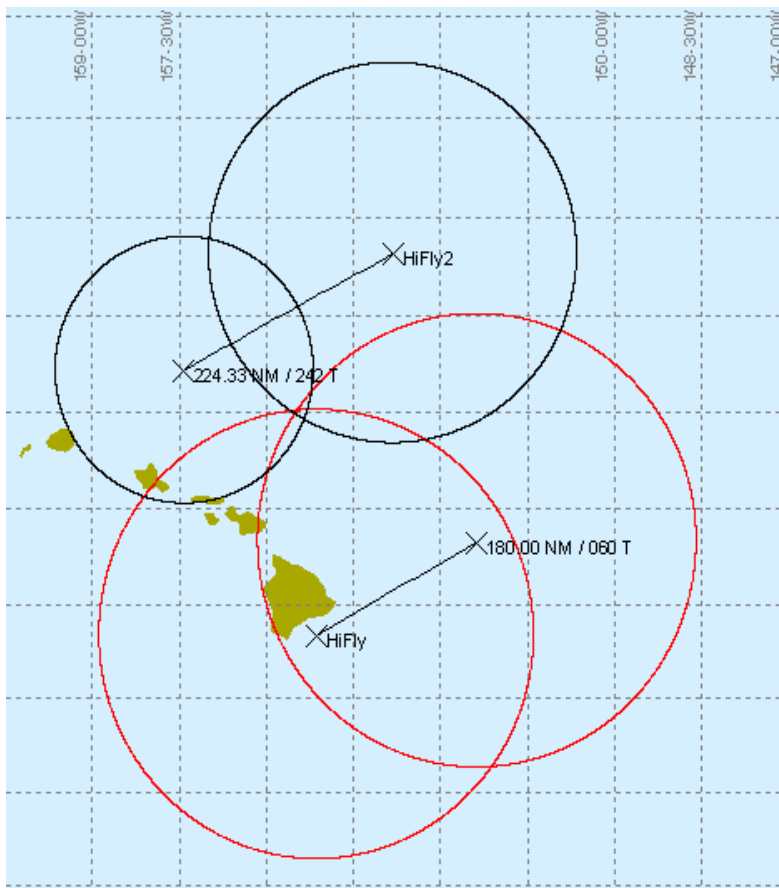


Figure 10 Plot of PFH, PLH and respective radio horizon range circles; Hifly at 30,000 feet and course of 060 deg T; Hifly2 at 20,000 feet and descending to 10,000 feet and course of 242 deg T.

CAUTIONS and NOTES:

1. **Reports of first heard and last heard may not be accurate.** The people monitoring the radio may not immediately hear or recognize the 121.5 MHz distress beacon swept tone. Both the time and location may be in error.
 - a. The beacon may have started transmitting after the high-flying aircraft was already well within the maximum detection range. The beacon may cease transmitting well before the aircraft is beyond the maximum detection range. Or both events could occur. An effort should be made to determine whether the signal seemed strong when first acquired and then faded, or was getting stronger and then abruptly ceased, or started suddenly, stopped suddenly, and seemed to be about the same strength the whole time it was heard. In either of the cases, the given procedure should still work, although the area of the intersection of the two circles will be enlarged as the result of their centers being closer together than they would be if signal acquisition and loss were due solely to the aircraft coming within maximum detection range and then moving beyond maximum detection range while the beacon was transmitting.

- b. As a part of the report data gathering process it should also be ascertained that the receiving radio was already on (not turned on and the signal was there) and that adjustments to the squelch were not made (squelch turned down and the signal was there). These situations may occur when seeking additional reports aircraft are alerted to listen and they adjust their radios. In those cases, the initial position they provide may not be useful, but the position for the last heard point could be used and added to the knowledge from previous reports.
2. **Reports from a single aircraft may occur at different altitudes or courses.** Aircraft, particularly those under instrument flight rules may be ascending, descending and/or changing course according to their flight plan and air route traffic control needs. The consequence is that in some instances the first heard and last heard reports could be from different altitudes or on different courses. The course change is not all that significant as the heard distance will remain the distance between first heard and last heard. Knowing the turn point in this case could be helpful as it allows drawing another range circle which can be combined with the first heard and last heard generated range circles to more narrowly define the area. When the reports occur at different altitudes the appropriate range circles for each need to be drawn to discover the intersect points.
3. **The sending antenna may have some height above sea level.** The calculations above ignored the obvious likelihood that the EPIRB or ELT transmitting the 121.5 MHz alert may not be sitting on the surface, but may be anywhere from a couple of feet up to tens of feet above the ground. The height of the sending antenna should be considered and the distance added to the reception range. We will not address the “what if” situation for an aircraft flying with an active beacon.
4. **The Hawaii example case notes.**
 - a. In the illustration, the entire island of Hawaii is included in the intersection of the two circles and should be considered as a possible location of a forced landing site.
 - b. If an aircraft experienced a forced landing on Hawaii, the first heard and last heard positions may be affected by the forced landing site's altitude (which could be quite high) and the terrain surrounding the site, which could block the signal in some directions.
 - c. These same factors should be considered in any case where the radio horizon range circle crosses land, particularly with high terrain.

Agenda Item 3.3: RASMAG

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.3 Regional Airspace Safety Monitoring Advisory Group (RASMAG)

3.3.1 The meeting reviewed a consolidated report of the Tenth and Eleventh Meetings of the Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG/10 and 11), held in December 2008 and June 2009, respectively. Full copies of the meeting reports are available on the web site of the ICAO Asia and Pacific Office at <http://www.bangkok.icao.int/> under the 'Meetings' menu. The meeting expressed its appreciation for the many tasks that had been addressed by RASMAG since reporting to APANPIRG/19 last year.

RASMAG List of Competent Airspace Safety Monitoring Organizations

3.3.2 RASMAG is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of monitoring organizations. The updated "*RASMAG List of Competent Airspace Safety Monitoring Organizations*" is shown at **Appendix A** to the Report on Agenda Item 3.3.

Asia/Pacific RVSM Safety Assessments

3.3.3 Assessment of the safety performance of RVSM airspace is undertaken by specialist assessment bodies known as Regional Monitoring Agencies (RMAs), which are specifically established to undertake the on-going monitoring of RVSM operations in order to meet ICAO Standards. For the Asia and Pacific regions, APANPIRG-endorsed RMA services are provided by:

- a) The Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia.
- b) The China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC).
- c) The JCAB RMA, operated by the Japan Civil Aviation Bureau.
- d) The Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI).
- e) The Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration.

3.3.4 To facilitate ongoing vertical safety assessment, the Asia and Pacific regional RVSM airspaces are broadly divided into the following sub areas:

- a) Melbourne, Brisbane, Nauru, Honiara FIRs (AAMA)
- b) Port Moresby FIR (AAMA),
- c) Indonesian FIRs (AAMA),
- d) Sovereign airspaces of China (China RMA)
- e) Fukuoka FIR (JCAB RMA),
- f) Bay of Bengal FIRs (MAAR),

- g) Western Pacific/South China Sea FIRs (MAAR),
- h) Pacific Area (PARMO), and
- i) North-East Asia Incheon FIR (PARMO),

3.3.5 The meeting reviewed a consolidated report of the RVSM safety performance across the Asia/Pacific Region. The meeting recognized that this summary of RVSM safety performance comprised the reporting called for by the Asia/Pacific Safety Metric “*Percentage of RMA sub-regions achieving the regional Target Level of Safety (TLS) for RVSM operations, as of April each year*” that had been adopted by the meeting (refer paragraphs 3.0.12 to 3.0.13 above), and noted that:

- a) RVSM safety monitoring in Asia/Pacific is undertaken as a regional programme in accordance with Annex 11 provisions;
- b) With the exception of the Pyongyang and Ulaanbaatar FIRs, RVSM has been implemented throughout the Asia/Pacific Region. Pyongyang is scheduled for October 2009 and Ulaanbaatar in 2012 in conjunction with the Russian Federation;
- c) In general terms, the regional TLS for RVSM operations is being widely satisfied across the Asia/Pacific Region;
- d) However, the June 2009 RASMAG analysis noted the regional TLS was not being satisfied in Australian airspace, Indonesian airspace and Fukuoka FIR. Active investigation and remediation by affected States is ongoing and Australia updated the meeting that their most recent review (August 2009) demonstrated that the TLS was again being satisfied;
- e) RASMAG has concerns in relation to under reporting of Large Height Deviations in the Bay of Bengal airspace and considers that the outcomes from the Bay of Bengal safety assessments can not be considered as statistically reliable;
- f) The Western Pacific/South China Sea airspace now satisfies the TLS, this is due to the focused efforts of the WPAC/SCS RVSM Scrutiny Group over the past 2 years; a
- g) The single biggest issue leading to Large Height Deviations in the Asia/Pacific RVSM operational environment remains that of errors in the ATC Unit-to-ATC Unit coordination interface; and
- h) For the South China Sea parallel route structure the horizontal TLS (lateral and longitudinal) is being satisfied.

South China Sea Horizontal Safety Assessments

3.3.6 RASMAG had reviewed analysis from the South East Asia Safety Monitoring Agency (SEASMA, operated by Civil Aviation Authority of Singapore) in relation to their most recent examination of operations on the six major air traffic service routes in South China Sea airspace, conducted in order to determine compliance with Asia/Pacific Region safety goals for the established lateral and longitudinal separation standards. The examination covered the period May 2008 through April 2009 and used analysis techniques developed in conformance with internationally

applied collision risk methodology. The risk assessment employed data collected from the ongoing navigational error monitoring programme to analyze navigational performance on the routes and took into account the July 2008 reduction in the lateral and longitudinal separation minima applied to two of the routes, L642 and M771.

3.3.7 The Table below presents the total traffic counts reported by month transiting all South China Sea horizontal monitoring fixes.

Monitoring Month	Total Monthly Traffic Count Reported Over Monitored Fixes	Cumulative 12-Month Count of Traffic Reported Over Monitored Fixes Through Monitoring Month
May 2008	8123	81591
June 2008	7743	83239
July 2008	8423	85383
August 2008	7568	86638
September 2008	7293	87800
October 2008	7673	89029
November 2008	6576	89457
December 2008	6665	89597
January 2009	7244	90880
February 2009	6380	89434
March 2009	7016	88438
April 2009	6603	87307

Monthly Count of Monitored Flights Operating on South China Sea RNAV Routes

3.3.8 The safety assessment demonstrates that both the lateral and longitudinal safety performance on the South China Sea RNAV six-route system are compliant with the regional TLS. The safety assessment also concludes that applying the existing reduced lateral and longitudinal minima used on L642 and M771 (RNP 10 based 50 NM/50 NM) to the other four South China Sea routes would also meet established TLS values.

RVSM Minimum Monitoring Requirements

3.3.9 In recognition of the need for long term global monitoring of the height-keeping performance of airframes used in RVSM operations, deliberations by the ICAO Separation and Airspace Safety Panel (SASP) and actions by the ICAO Air Navigation Commission (ANC) have recently resulted in the addition of long-term RVSM monitoring requirements to Annex 6, with the effective date of the requirements planned for November 2010.

3.3.10 The meeting understood that the Annex 6 provisions would take effect from November 2010, so were not presently applicable, and learned that the RMA Manual was further delayed. The meeting recognized that the RVSM Minimum Monitoring Requirements (MMRs) that had been agreed by RASMAG/3 and used since then (as amended) in the Asia/Pacific Region had minimal differences from the MMRs in the draft RMA Manual and were always at least equal to or more exacting than the Annex 6 requirements that would take effect from November 2010. Accordingly, the meeting agreed that, in the interim until the RMA Manual became available and/or the Annex 6 provisions became applicable, the existing RASMAG MMRs should continue in use by Asia/Pacific RMAs and adopted the following Conclusion:

Conclusion 20/20 – Adopt RVSM Minimum Monitoring Requirements

That the RVSM Minimum Monitoring Requirements (MMRs) shown in **Appendix B** to the APANPIRG/20 Report on Agenda Item 3.3 be adopted as the MMRs applicable for the Asia/Pacific Region.

Expand December TSD for airspace planning

3.3.11 Although the annual December traffic sample data (TSD) required by Conclusion 16/4 was currently used exclusively for airspace safety monitoring purposes, a number of implementing bodies considered that this annual traffic count would provide a very useful source of data for airspace planning purposes in general. Accordingly, RASMAG was requested to review the situation with the objective of expanding the use of the annual December RVSM data collection for airspace planning and implementation in general (ATFM, PBN, ATS routes etc). This would enable the data to be made available to implementation groups as required to support all regional ATM implementations.

3.3.12 After considering this proposal RASMAG gave in-principle agreement to the concept. However, beyond agreeing to the expansion of the standardized template for the annual December TSD gathering to include the registration/tail number (if available) and en-route PBN approval (if available), regional RMAs were not able to accommodate extra workload or responsibilities in gathering and managing data. RASMAG recommended that release of data should be authorized by an appropriate oversight body, such as the Regional Office. Additionally, RMAs also clearly preferred that wherever possible implementing agencies obtained data directly from the States or parties involved in each implementation. The meeting agreed to the following Decision in this respect:

Decision 20/21 – Expand use of safety monitoring data

That the arrangements for annual month of December traffic sample data by all States to satisfy airspace safety monitoring analysis called for by APANPIRG Conclusion 16/4 be expanded to enable this data to also be available for airspace planning and implementation purposes. This will apply only where such data is not otherwise available to regional or State implementing bodies and only with specific written authority of the ICAO Asia/Pacific Regional Office on each occasion.

Difficulties in RMA coordination with States

3.3.13 The meeting recalled that in relation to RVSM monitoring, APANPIRG/19 agreed that implementing effective coordination arrangements between States and RMAs was a critical first step and adopted Conclusion 19/5 encouraging States to immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs.

3.3.14 Discussion took place during RASMAG/10&11 regarding the ability of an RMA to effectively obtain information from State authorities that are less than cooperative. Despite the efforts of RASMAG and APANPIRG, on many occasions RMAs are being ignored when they ask for RMA approvals status for particular airframes or additional information in relation to specific aircraft. The meeting noted that this is a perennial problem for RMAs however recognized that States (i.e. not RMAs) are the party responsible for compliance with Annex provisions – including Annex 6 and Annex 11 in regard to safety monitoring. Clearly, RMAs are not able to assist those States who do not provide appropriate data to RMAs.

3.3.15 The meeting urged States to take necessary actions to swiftly improve this situation and agreed that, in addition to Conclusion 19/5, States would be asked for their current RVSM approvals data as an additional item for transmission to the RMAs with the annual December TSD required under Conclusion 16/4, and that a standard letter template would also be drafted by RASMAG for RMAs to use when required in support of specific enquiries to States. The following Conclusion was adopted in this respect:

Conclusion 20/22 – Provide Annual Update of RVSM Approvals to RMAs

That, in addition to the continuous update of RVSM Approvals data called for by Conclusion 19/15 and APANPIRG RMA requirements, States provide an update of RVSM Approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4.

RVSM Non - Approved Operators Using RVSM Airspace

3.3.16 APANPIRG/19 had expressed serious concern in relation to flights that were apparently using RVSM airspace when they did not have the State approvals to do so. In agreeing that this issue ultimately required regulatory intervention, APANPIRG requested RASMAG to continue its investigations in this regard with the objective of providing a more comprehensive briefing to APANPIRG in relation to this issue.

3.3.17 In this context, RASMAG discussed a number of possible methods to identify non-approved operators. The most readily available method was to compare flights in the annual December TSD against the RVSM approvals databases maintained by regulatory authorities. This was already a normal method used by regional RMAs, and RMAs agreed to ensure diligence in this approach.

3.3.18 However, the meeting recognised that the shortcomings in data provision by States to RMAs (discussed in paragraphs 3.3.13 to 3.3.15 above) were contributing to the difficulties being experienced by RASMAG in investigating the size and complexity of this problem. For example, as States were not providing up-to-date information on RVSM approvals, RMAs were unable to reliably check whether an aircraft that had filed a plan indicating RVSM approval (i.e. ‘W’) was actually approved or not. Until the availability of data was enhanced, this problem would persist and RASMAG would continue to have difficulty progressing the investigations.

Analysis of 100 foot misalignment between metric/imperial FLAS

3.3.19 IATA had drawn the attention of RASMAG to the fact that following the implementation of RVSM in China, operational errors between a Chinese FIR and an adjacent FIR applying RVSM in feet could result in the aircraft being misaligned by 100 feet. For example, an aircraft that was required to transition from FL331 to FL330 but failed to do so would be misaligned by plus 100 feet.

3.3.20 In considering this issue, RASMAG concluded that:

- a) The misalignment of 100 feet was an operational error and therefore should be identified and addressed by State and airline safety management systems, with remedial measures applied accordingly, and
- b) The globally recognized collision risk model applied for the RVSM had been developed over a long period of time and used an empirical basis coupled with robust mathematical methodologies to exclude height deviations of less

than 300 feet for the assessment of operational errors. However, the technical risk component considers all errors, including 100 foot errors, in its assessment. This determination of the assigned altitude deviation (AAD) is statistically combined with the altimetry system error (ASE) and assures that the total vertical error (TVE) distribution includes estimates of this nature of behavior, complete with its relative proportion.

3.3.21 RASMAG concluded that based on quantitative analysis, fitting distribution and technical risk comparison methodologies the misalignment of 100 feet does not demonstrate any influence (positive or negative) on RVSM airspace safety performance and therefore should not be reported as a LHD, although such situations should be fully addressed under normal safety management system processes. RASMAG noted that no reports of operational errors involving a 100 foot misalignment situation had been received by Asia/Pacific RMAs since the RVSM implementation in China. The meeting recalled that the metric RVSM flight level arrangements implemented in China have now been incorporated into the Annex 2 Tables of Cruising Levels

RASMAG review of WPAC/SCS RSG/6

3.3.22 RASMAG noted the proposed dissolution of the Western Pacific/South China Sea RVSM Scrutiny Group (WPAC/SCS RSG) and commended the excellent outcomes that had been achieved by the participants of the WPAC/SCS RSG. In respect to the major concerns that had originally led APANPIRG to establish the WPAC/SCS RSG, the implementation of the revised flight level arrangements in July 2008 had resulted in greater harmonisation with the flight level arrangements in airspaces surrounding the WPAC/SCS area. Strategies implemented by States for the management of LHDs were having a significant beneficial effect which had resulted in very positive trends in safety performance that were expected to ensure the regional TLS continued to be met for the foreseeable future.

DPRK RVSM implementation

3.3.23 The meeting recalled the intention of the Democratic People's Republic of Korea (DPRK) to implement RVSM in the Pyongyang FIR during 2009 and learned that, in coordination with the Regional Office, DPRK had adopted the October 2009 AIRAC date for implementation.

3.3.24 As a result of coordination through RASMAG, the China RMA provided extensive technical support, including provision of safety assessment and monitoring services for the DPRK implementation. The pre implementation safety assessment demonstrates that, based on the collected TSD and available State RVSM approval data, more than 98.88% of the aircraft operations in the Pyongyang FIR where RVSM is to be implemented have been conducted by RVSM airworthiness approved aircraft and 98.88% by fully RVSM approved operators and aircraft.

3.3.25 The safety assessment also demonstrates that based on the collected TSD and LHD reports, the technical risk estimate is 5.62×10^{-10} fatal accidents per flight hour and the overall risk is 1.66×10^{-9} . Both estimates satisfy the regionally agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 300m (1,000ft) and to all causes, respectively. In addition, the safety assessment report also defines the risk estimate for ATS route B467, which is the busiest route in the Pyongyang FIR. It is found that technical risk is 7.40×10^{-10} and the overall risk is 2.29×10^{-9} fatal accidents per flight hour, which also satisfy the regional TLS.

3.3.26 The meeting commended China and the China RMA for the technical support to the DPRK implementation.

3.3.27 A Regional Office mission to DPRK during late July 2009 had recommended that the RVSM implementation proceed as scheduled, noting that in addition to the satisfactory risk estimates described above:

- a) DPRK had understood and complied with comprehensive RVSM implementation guidance material and task lists provided by the Regional Office. All matters raised by the Regional Office had either already been addressed or work programmes were in place to ensure that matters would be addressed before implementation;
- b) The flight level arrangements to be implemented were in compliance with the metric RVSM flight levels promulgated in Annex 2;
- c) ATS Operational Letters of Agreement (LOAs) had been coordinated with neighbouring ACCs and updated to include appropriate provisions, including flight level transition arrangements as necessary, and the amended LOAs had already been signed; and
- d) No impediment to the implementation of RVSM during October 2009 as scheduled was identified.

Regional Impact Statement on Long Term RVSM Monitoring

3.3.28 APANPIRG/18 (September 2007) had recognized that the 2010 implementation of Annex 6 global long term monitoring requirements for airframes used in RVSM operations would have significant impacts in the way regional monitoring was managed, including the need for widespread regional height monitoring infrastructure capability to be made available. Under Conclusion 18/4, APANPIRG tasked Asia/Pacific RMAs to work with RASMAG to prepare a regional impact statement summarizing the estimated consequences for the Region, including consideration of the numbers of airframes to be monitored and the ground infrastructure required.

3.3.29 The meeting reviewed the *Asia/Pacific Regional Impact Statement – RVSM Global Long Term Height Monitoring Requirements effective from November 2010* submitted by RASMAG, noting the probable monitoring burden of approximately 1385 airframes region-wide in the 2 years ending November 2012.

3.3.30 The impact statement highlights that three primary objectives need to be achieved in terms of RVSM height monitoring:

- a) Compliance with a basic Minimum Monitoring Requirement (MMR - e.g. two aircraft per type, per operator, per two years),
- b) Conduct of analyses of aircraft group performance, and
- c) Evaluation of the stability of altimetry system error.

3.3.31 Achievement of the first objective is via sampling of relatively few airframes at relatively long intervals. Achievement of the other two objectives requires large volumes of data obtained via repeated sampling of airframes over extended periods of time using ground-based monitoring equipment.

3.3.32 Additional monitoring infrastructure will need to be deployed in the Asia/Pacific Region. A range of proven monitoring systems is currently available, including ground-based fixed installation Height Monitoring Units (HMUs, also known in North America as Aircraft Geometric Height Measurement Elements –AGHMEs) and portable airborne GPS Monitoring Units (GMUs). A mix of ground-based and portable GMU capability will be required. At present, there are no HMU installations operating in the Asia/Pacific region and only limited portable GMU monitoring capability is available via Asia/Pacific RMAs.

3.3.33 The impact statement reports that a review of the region's major international traffic flows suggests that appropriate locations for installation of ground-based monitoring systems could include Australia/New Zealand, Southeast Asia, Northeast Asia, China and India/Pakistan. The availability of ground-based monitoring capabilities in these five areas would adequately serve the majority of international traffic flows, whilst also catering for the disposition and monitoring of the larger domestic fleet operations in Australia, China and India. Adoption of such a ground-based infrastructure could mean that existing regional portable GMU capability is adequate. However, the absence of suitable ground-based infrastructure means that investment in GMU capabilities will be necessary.

3.3.34 Japan has already indicated its intention to deploy three HMUs situated within the airspace of Japan, with the first HMU targeted to become operational in 2011.

3.3.35 IATA recognized that some States have announced their intention to deploy ground-based height monitoring capability in the near term. Whilst acknowledging States domestic requirements, IATA remains concerned as to how State plans fit into a region wide solution. Given the rapid development of ADS-B in Asia/Pacific Region, IATA believes that the viability of ADS-B as a method for height monitoring must be confirmed before States develop their own plans to implement a network of HMUs, in order to avoid an unnecessary proliferation of ground based monitoring infrastructure throughout the region.

3.3.36 The United States cautioned the meeting that although the use of ADS-B for height monitoring purposes is currently under development with the trials in the USA to date showing encouraging results, as well as the need to be proven to be technically suitable, using ADS-B data alone to monitor will be unlikely to provide a complete sample of the airspace population unless a mandated ADS-B fitment requirement exists for the particular region or State. The advice from the United States was supported by several others and, as such, it is expected to be some time before ADS-B provides a practical monitoring capability.

3.3.37 The meeting noted that as the Annex 6 provisions become applicable in November 2010, urgent action was necessary to ensure compliance with the SARPS. The meeting recognised that HMU siting requirements needed significant study, and anecdotally understood that the HMU equipment itself used multilateration concepts comprising at least 3 sensors in a triangular pattern with 8 – 10 NM legs.

3.3.38 It was evident that more information was needed on which to base any decision and the meeting agreed that RASMAG would be tasked to conduct further investigations and attempt to recommend the types and appropriate locations of monitoring systems to most effectively monitor the Asia/Pacific aircraft population with the least infrastructure investment.

3.3.39 The Regional Office would attempt to ascertain the interest of States in response to the areas described in the impact statement and assess their potential position in regard to hosting a HMU. The Regional Office would also gather relevant information by correspondence and provide any useful material to the RASMAG for consideration. The meeting thanked RASMAG for the excellent work in preparing the impact statement and raised the following Conclusion:

Conclusion 20/23 – Adopt RVSM Monitoring Impact Statement

That the *Asia/Pacific Regional Impact Statement – RVSM Global Long Term Height Monitoring Requirements effective from November 2010*, as shown in **Appendix C** to the APANPIRG/20 report on Agenda Item 3.3, be adopted and circulated as Asia/Pacific regional guidance material.

Horizontal safety assessment and monitoring

3.3.40 APANPIRG had long recognized that although arrangements for monitoring in the vertical plane (RVSM) using RMAs were comparatively advanced, there was a need to further develop regional safety assessment and monitoring capability in the horizontal plane (i.e. lateral and longitudinal). In this context, the following Decision had been taken by APANPIRG during August 2005:

Decision 16/1 – Safety Monitoring Agency (SMA)

That, the term Safety Monitoring Agency (SMA) be used to describe an organization approved by regional agreement to provide airspace safety monitoring and implementation services for international airspace in the Asia/Pacific region for implementation and operation of reduced horizontal separation.

3.3.41 It was clear that the intent of this decision was that Asia/Pacific SMAs would be “*approved by regional agreement*” i.e. an APANPIRG approval in a similar manner to the process adopted for RVSM RMAs. In relation to vertical monitoring, the meeting recognized that the RMA requirements were precipitated, in part, by the Standard in Annex 11 that required RVSM monitoring to be conducted on a ‘regional’ basis (Annex 11, paragraph 3.3.5.1 refers).

3.3.42 However, although horizontal safety monitoring was also required under ICAO provisions, the stipulation that the monitoring be conducted on a regional basis was not made – meaning that each State could conduct the monitoring on an individual basis. Notwithstanding, the meeting recognized that, for many of the States with smaller airspaces, to conduct monitoring individually would not be as efficient and effective as working together in a regional or sub-regional manner.

3.3.43 Recognizing that there was no primary ICAO provision requiring regional PIRG approval for horizontal safety matters, RASMAG was of the view that a suitable ‘approval’ process could be adequately managed under the auspices of RASMAG and recommended that requirements for the regional agreement of SMAs, as described in Decision 16/1 above, be set aside. The meeting agreed that instead, RASMAG would take responsibility for ensuring that horizontal assessment and monitoring matters proceed appropriately in the region, based on the collaborative activities and working methods already established and followed so successfully by regional RMAs. Appropriate horizontal monitoring agencies would be included on the RASMAG *List of Competent Airspace Safety Monitoring Organizations* once RASMAG was satisfied that their capabilities were adequate.

3.3.44 The meeting learned that the term Safety Monitoring Agency, which had been adopted by Decision 16/1, also had a meaning in common English language which applied equally to all safety monitoring agencies, be they for vertical, horizontal, data link or other safety monitoring. This had caused confusion in a number of forums and required regular explanation. The meeting agreed that a more suitable name would be appropriate for horizontal monitoring agencies and, in order to clarify that the function presently intended and supported by RASMAG was confined to horizontal aspects of en-route operations, adopted the following Decision to supersede Decision 16/1:

Decision 20/24 – En-route Monitoring Agency (EMA)

That the term En-route Monitoring Agency (EMA) be used to describe an organization providing airspace safety assessment, monitoring and implementation services for international airspace in the Asia/Pacific Region to support implementation and operation of reduced horizontal (lateral and longitudinal) separation.

En-Route Monitoring Agency (EMA) Handbook

3.3.45 RASMAG was established by APANPIRG during 2004 to achieve a regional approach for coordination and harmonization of airspace safety monitoring activities, and to provide assistance to States in this respect. RASMAG noted that requirements for monitoring aircraft height-keeping performance and the safety of RVSM operations had been more comprehensively developed than had requirements for monitoring other air traffic management (ATM) services, such as reduced horizontal separation based on performance based navigation (PBN), or for monitoring of air traffic services (ATS) data link systems. However, there was no monitoring guidance document under development by ICAO for the safe use of a horizontal-plane separation minimum where PBN is applied and no suitable regional equivalent was available.

3.3.46 RASMAG noted that the recent inclusion of the previously independent RNP and RNAV concepts under ICAO's global PBN concept has led to some uncertainty amongst States regarding the monitoring requirements for new horizontal separation minima implementations where these minima are based on PBN approvals. In anticipation of more widespread use of the PBN RNAV 10 and RNP 4 navigation specifications within the international airspace of the Asia/Pacific Region, the RASMAG agreed that there was a need to develop a handbook aimed at standardizing the principles and practices of the work of the En-route Monitoring Agencies (EMAs) established to assess the safety performance of implementations utilizing reduced horizontal plane separations.

3.3.47 Accordingly, RASMAG prepared a regional En-Route Monitoring Agency Handbook in order to assist adoption of a common set of principles and practices for safety assessment and ongoing safety monitoring in connection with operational usage of reduced horizontal-plane separation minima based on the application of PBN. The handbook is expected to also help to promote an interchange of information among Asia/Pacific States in support of achieving common operational horizontal monitoring procedures, as well as supporting the acquisition and sharing of data resulting from the application of those procedures. The meeting agreed to the following Conclusion:

Conclusion 20/25 – Adopt En-route Monitoring Agency (EMA) Handbook

That the *Asia/Pacific En-route Monitoring Agency (EMA) Handbook*, as shown in **Appendix D** to the APANPIRG/20 report on Agenda Item 3.3, be adopted and circulated as Asia/Pacific regional guidance material.

Review of Interim PBN Regional Plan

3.3.48 RASMAG/10 reviewed the interim edition of the Regional PBN Plan adopted by APANPIRG/19 and proposed additional text for Section 9 - *Safety Assessment & Monitoring Requirements* to clarify that the responsibility for safety assessment and ongoing monitoring lies with the implementing States, not with RASMAG. States were encouraged to coordinate with RASMAG regarding the en-route safety assessment and monitoring requirements and methodologies. RASMAG/10 also proposed a number of editorial updates for inclusion in the Plan.

Lack of State capabilities to conduct PBN safety assessments

3.3.49 RASMAG and the ATM/AIS/SAR Sub Group had received input from States that highlighted that although the responsibility for safety assessment and ongoing monitoring lies with the implementing States, it was evident that some States in the Asia/Pacific Region neither have the level of technical expertise nor the resources to conduct PBN safety assessments or implement ongoing monitoring arrangements for either the en-route or terminal area environments.

3.3.50 The work programme for RASMAG was structured to primarily address vertical and horizontal safety monitoring in international airspace. As such, PBN en-route implementations were already under the purview of RASMAG and significant effort had already been committed over the past two years to establishing horizontal monitoring capability and guidance, as recorded in the EMA Handbook. Regrettably, RASMAG had been too busy to address the data link monitoring requirements that were also under their responsibility and recognized that these matters were long overdue. As RASMAG's focus was on international airspace, as terminal area matters lay within the sovereign airspace of States, RASMAG had little capability or capacity to consider this area.

3.3.51 RASMAG/11 also recalled the laborious efforts previously undertaken by RASMAG to establish fair and efficient mechanisms for the funding of regional airspace safety monitoring. Ultimately, these matters had proven too complex and agreement had been reached through APANPIRG that the parties presently providing vertical and data link monitoring services would continue to absorb the cost on behalf of the States being assisted. Since that time the demand for horizontal monitoring services to service PBN implementation had grown, however funding arrangements were not in place and horizontal monitoring capabilities were very limited regionally.

3.3.52 The meeting was informed that, in the opinion of RASMAG, this was an important matter to be addressed in order to ensure adequate safety monitoring could urgently be made available to assist PBN implementation in both the en-route and terminal environments. Although the EMA Handbook prepared by RASMAG described *what* was necessary in the en-route context, it did not provide a solution as to *how* this work would be done. Noting that the Terms of Reference (TORs) of the PBN/TF already included responsibilities in this respect, notably at items 2), 3), 6) & 7) of the TORs, the meeting recognized that the PBN/TF was already pursuing a work programme in this respect.

RASMAG future support

3.3.53 On behalf of the meeting and with the full support of IATA, the Chairman thanked the RASMAG for the excellent work that had been completed in addressing the many complex matters on the RASMAG work programme as well as producing a number of useful regional guidance materials. The leadership of RASMAG Chairman Mr. Robert Butcher, of Airservices Australia, was highly commended.

3.3.54 In similarly commending the continuous good work of the RASMAG Secretariat, the United States drew attention to a change in staffing that would occur at the Regional Office in the near future. The meeting strongly recommended that serious attention be given by ICAO to ensuring that appropriate secretarial services were made available by the Regional Office in order to ensure that the existing periodicity and high calibre of RASMAG meetings was maintained into the future.

APANPIRG Asia/Pacific Airspace Safety Monitoring

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANIZATIONS

The Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG) is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of airspace monitoring organizations. In order to assist in addressing these requirements, RASMAG updates and distributes the following list of competent airspace safety monitoring organizations for use by States requiring airspace safety monitoring services. In the context of the list, abbreviations have meanings as follows:

- RMA – Regional Monitoring Agency – safety assessment and monitoring in the vertical plane (i.e. RVSM);
- EMA – En-route Monitoring Agency – safety assessment and monitoring in the horizontal plane (i.e. RHSM, RNAV10, RNP4);
- CRA – Central Reporting Agency – technical performance of data link systems (i.e. ADS/CPDLC); and
- FIT – FANS 1/A Interoperability/Implementation Team – parent body to a CRA.

(last updated 12 June 2009)

Organisation <i>(including contact officer)</i>	State	Competency	Status	Airspace assessed (FIRs)
Australian Airspace Monitoring Agency (AAMA) - Airservices Australia Mr Robert Butcher, Operational Analysis Manager, Safety and Environment Group email: robert.butcher@airservicesaustralia.com	Australia	APANPIRG RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang FIRs.
		EMA	Current	Brisbane, Melbourne FIRs.

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Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
China RMA - Air Traffic Management Bureau, (ATMB) of Civil Aviation Administration of China (CAAC) Mr. Tang Jinxiang, Engineer of Safety and Monitoring Technical Group, ATMB email: tangjx@adcc.com.cn	China	APANPIRG RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi and Wuhan FIRs and Sector 01 (airspace over Hainan Island) of the Sanya FIR, Pyongyang.
JCAB RMA - Japan Civil Aviation Bureau Mr. Kazunaga Suzuki, Special Assistant to the Director, Flight Procedures and Airspace Program Office, email: suzuki-k22z@mlit.go.jp	Japan	APANPIRG RMA	Current	Fukuoka FIR
		EMA	Available fourth quarter – 2009	Fukuoka FIR
Monitoring Agency for the Asia Region (MAAR) – Aeronautical Radio of Thailand LTD Mr. Nuttakajorn Yanpirat, Executive Officer, Systems Engineering, Aeronautical Radio of Thailand Ltd. email: nuttakajorn.ya@aerothai.co.th	Thailand	APANPIRG RMA	Current	Bangkok, Kolkatta, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Sanya FIR, Singapore, Taipei, Ulaan Bataar, Vientiane, Yangon FIRs

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Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) Mr. Dale Livingston, Manager, Separation Standards Analysis Team, FAA, email: dale.livingston@faa.gov	USA	APANPIRG RMA	Current	Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, Tahiti FIRs
		EMA	Current	Anchorage Oceanic, Oakland Oceanic
South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS) Mr. Kuah Kong Beng, Chief Air Traffic Control Officer, email: KUAH_Kong_Beng@caas.gov.sg	Singapore	EMA for South China Sea	Current	Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Sanya and Singapore FIRs
FIT - SEA (ICAO Regional Office email icao_apac@bangkok.icao.int & CRA Japan Mr. Mitsuo Hayasaka, Deputy Director, Air Traffic Control Association Japan, email: hayasaka@atcaj.or.jp	ICAO Regional Office & CRA Japan	FIT & CRA	Current	South China Sea FIRs

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Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
IPACG/FIT Mr. Takahiro Morishima, JCAB Co-Chair, email: morishima-t2zg@mlit.go.jp & Mr. Reed Sladen, FAA Co-Chair, email: reed.b.sladen@faa.gov	Japan & USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
CRA Japan Mr. Mitsuo Hayasaka, Deputy Director, Air Traffic Control Association Japan, email: hayasaka@atcaj.or.jp	Japan	CRA	Current	Fukuoka FIR for IPACG/FIT Ho Chi Minh, Manila, Singapore FIRs for FIT-SEA
FIT - BOB ICAO Regional Office email icao_apac@bangkok.icao.int & Mr. Bradley Cornell, Boeing Engineering, email: Bradley.D.Cornell@Boeing.Com	ICAO Regional Office & Boeing USA	FIT & CRA	Current	Bay of Bengal FIRs, Ujung Pandang and Jakarta FIRs, provides assistance to the members of the Arabian Sea/Indian Ocean ATS Coordination Group (ASIOACG)
ISPACG/FIT Mr. Bradley Cornell, Boeing Engineering, email: Bradley.D.Cornell@Boeing.Com	Boeing USA	FIT & CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

ASIA PACIFIC RVSM MINIMUM MONITORING REQUIREMENTS (MMRs)

(Last reviewed RASMAG/11, June 2009)

1. UPDATE OF MONITORING REQUIREMENTS TABLE AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When the table is updated, a letter will be distributed to States and operators. The updated table will be posted on the websites of the APAC Regional Monitoring Agencies (RMAs) on behalf of the International Civil Aviation Organization (ICAO) Asia-Pacific Regional Planning Group (APANPIRG).
2. INITIAL MONITORING. All operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring programme. The attached table of monitoring requirements establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must include a plan that demonstrates the process that will be used to meet the applicable initial monitoring requirements.
3. AIRCRAFT STATUS FOR MONITORING. Aircraft engineering work that is required for the aircraft to receive RVSM airworthiness approval must be completed prior to the aircraft being monitored. Any exception to this rule shall be coordinated with the State authority.
4. APPLICABILITY OF MONITORING FROM OTHER REGIONS. Monitoring data obtained in conjunction with RVSM monitoring programmes from other regions can be used to meet Asia/Pacific monitoring requirements. Asia/Pacific RMAs have access to monitoring data from other regions and will coordinate with States and operators to inform them on the status of individual operator monitoring requirements.
5. MONITORING PRIOR TO THE ISSUE OF RVSM OPERATIONAL APPROVAL IS NOT A REQUIREMENT. Operators should submit monitoring plans to the responsible civil aviation authority that show how they intend to meet the requirements specified in the attached table. Monitoring will be carried out in accordance with this table.
6. AIRCRAFT GROUPS NOT LISTED IN THE TABLE. Contact the RMA responsible for the State of registration for clarification if an aircraft group is not listed in the Minimum Monitoring Requirements table or for clarification of other monitoring related issues. An aircraft group not listed in the table below will probably be subject to Category 2 monitoring requirements.
7. TABLE OF MONITORING GROUPS. A table of monitoring groups is provided as an appendix to this Minimum Monitoring Requirements document. The table shows the aircraft types and series that are grouped together for operator monitoring purposes.
8. TRAILING CONE DATA. Altimetry System Error estimations developed using Trailing Cone data collected during RVSM certification flights can be used to fulfill monitoring requirements. It must be documented that aircraft RVSM systems were in the approved RVSM configuration for the flight.
9. MONITORING OF AIRFRAMES THAT ARE RVSM COMPLIANT ON DELIVERY. If an operator adds new RVSM compliant airframes of a type for which it already has RVSM operational approval and has completed monitoring requirements for the type in accordance with the attached table, the new airframes are not required to be monitored. If an operator adds new RVSM compliant airframes of an aircraft type for which it has NOT previously received RVSM operational approval, then the operator should complete monitoring in accordance with the attached tables.
10. FOLLOW-ON MONITORING. Monitoring is an on-going program that will continue indefinitely after the RVSM approval process. A follow-on sampling program for additional operator aircraft will be coordinated by the Asia-Pacific Regional Airspace Safety Monitoring Advisory Group (RASMAG).

EFFECTIVE AS OF: 12 June 2009

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE, HOWEVER, IT IS NOT REQUIRED TO BE COMPLETED PRIOR TO OPERATIONAL APPROVAL			
MONITORING CATEGORY		AIRCRAFT TYPE	MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP
1	Group approved <u>and</u> monitoring data indicates performance in accordance with RVSM standards. Group Definition: aircraft have been manufactured to a nominally identical design and build and for RVSM airworthiness approval fall into a group established in an RVSM certification document (e.g., Service Bulletin, Supplemental Type Certificate, Type Certificate Data Sheet).	[A30B, A306], [A312 (GE), A313 (GE)], [A312 (PW), A313 (PW)], A318, [A319, A320, A321], [A332, A333], [A342, A343], A344, A345, A346 B712, [B721, B722], [B733, B734, B735], B737(Cargo), [B736, B737/BBJ, B738/BBJ, B739], [B741, B742, B743], B74S, B744 (5" Probe), B744 (10" Probe), B752, B753, [B762, B763], B764, B772, B773 CL60(600/601), CL60(604), C560, [CRJ1, CRJ2], CRJ7, DC10, [E135, E145], [E170, E190], F100, GLF4, GLF5, LJ60 L101, MD10, MD11, MD80 (All series), MD90	Two airframes from each fleet* of an operator to be monitored as soon as possible but not later than 6 months after the issue of RVSM operational approval <i>* Note. For the purposes of monitoring, aircraft within brackets [] may be considered as belonging to the same monitoring group. For example, an operator with six A332 and four A333 aircraft may monitor one A332 and one A333 or two A332 aircraft or two A333 aircraft.</i>
2	Group approved but insufficient monitoring data collected to move aircraft to Monitoring Category 1. Group definition applies.	Other group aircraft other than those listed in Category 1 including: A124, A388, ASTR, B703, B731, B732, BE20, BE40, C500, C25A, C25B, C525, C550**, C56X, C650, C750, CRJ9, [DC86, DC87], DC93, DC95, F2TH, [FA50 FA50EX], F70, [F900, F900EX], FA20, FA10, GLF2(II), GLF(IIB), GLF3, GALX, GLEX, H25B(700), H25B(800), H25C, IL62, IL76, IL86, IL96, J328, L29(2), L29(731), LJ31, [LJ35, LJ36], LJ45, LJ55, SBR1, T134, T154, T204, P180, PRM1, YK42	60% of airframes from each fleet of an operator (round up if fractional), as soon as possible but not later than 6 months after the issue of RVSM operational approval. (*Note: If 60 percent of the fleet yields a fractional number, round up to the next whole aircraft (e.g., for a fleet of 2 aircraft, $0.6 \times 2 = 1.2$; therefore, 2 aircraft must be monitored). ** Refer to aircraft group table for detail on C550 monitoring
3	Non-Group Non-group Definition: aircraft that do not fall under the group definition <u>and</u> for RVSM airworthiness approval are presented as an individual airframe.	Non-group approved aircraft	100% of aircraft shall be monitored as soon as possible but not later than 6 months after the issue of RVSM operational approval.

**MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL
REQUIREMENTS**

Monitoring Group	ICAO Designator	A/C Type	A/C Series
A124	A124	AN-124 RUSLAN	ALL SERIES
A300	A306 A30B	A300 A300	600, 600F, 600R, 620, 620R, 620RF B2-100, B2-200, B4-100, B4-100F, B4-120, B4-200, B4-200F, B4-220, C4-200
A310-GE	A310	A310	200, 200F, 300, 300F
A310-PW	A310	A310	220, 220F, 320
A318	A318	A318	ALL SERIES
A320	A319 A320 A321	A319 A320 A321	CJ , 110, 130 110, 210, 230 110, 130, 210, 230
A330	A332, A333	A330	200, 220, 240, 300, 320, 340
A340	A342, A343,	A340	210, 310
A345	A345	A340	540
A346	A346	A340	640
A3ST	A3ST	A300	600R ST BELUGA
AN72	AN72	AN-74, AN-72	ALL SERIES
ASTR	ASTR	1125 ASTRA	ALL SERIES
ASTR-SPX	ASTR	ASTR SPX	ALL SERIES
AVRO	RJ1H, RJ70, RJ85	AVRO	RJ70, RJ85, RJ100
B712	B712	B717	200
B727	B721 B722	B727	100, 100C, 100F, 100QF, 200, 200F
B732	B732	B737	200, 200C
B737 (Classic)	B733 B734 B735	B737	300, 400, 500
B737 New Generation (NG)	B736 B737 B738 B739	B737 B737 B737 B737	600 700, 700BBJ 800 900
B737 (Cargo)	B737	B737	700C
B747 Classic (CL)	B741 B742 B743	B747	100, 100B, 100F, 200B, 200C, 200F, 200SF, 300
B74S	B74S	B747	SR, SP
B744-5	B744	B747	400, 400D, 400F (With 5 inch Probes)
B744-10	B744	B747	400, 400D, 400F (With 10 inch Probes)
B752	B752	B757	200, 200PF

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Monitoring Group	ICAO Designator	A/C Type	A/C Series
B753	B753	B757	300
B767	B762 B763	B767	200, 200EM, 200ER, 200ERM, 300, 300ER, 300ERF
B764	B764	B767	400ER
B772	B772	B777	200, 200ER, 300, 300ER
B773	B773	B777	300, 300ER
BE40	BE40	BEECHJET 400A	ALL SERIES
BE20	BE20	BEECH 200 –KINGAIR	ALL SERIES
C500	C500	500 CITATION, 500 CITATION I, 501 CITATION I SINGLE PILOT	ALL SERIES
C525	C525	525 CITATIONJET, 525 CITATIONJET I	ALL SERIES
C525-II	C25A	525A CITATIONJET II	ALL SERIES
C525 CJ3	C25B	CITATIONJET III	ALL SERIES
C550-552	C550	552 CITATION II	ALL SERIES
C550-B	C550	550 CITATION BRAVO	ALL SERIES
C550-II	C550	550 CITATION II, 551 CITATION II SINGLE PILOT	ALL SERIES
C550-SII	C550	S550 CITATION SUPER II	ALL SERIES
C560	C560	560 CITATION V, 560 CITATION V ULTRA, 560 CITATION V ULTRA ENCORE	ALL SERIES
C56X	C56X	560 CITATION EXCEL	ALL SERIES
C650	C650	650 CITATION III , 650 CITATION VI , 650 CITATION VII	ALL SERIES
C750	C750	750 CITATION X	ALL SERIES
CARJ	CRJ1, CRJ2	REGIONALJET	100, 200, 200ER, 200LR
CRJ-700	CRJ7	REGIONALJET	700
CRJ-900	CRJ9	REGIONALJET	900
CL600	CL60	CL-600 CL-601	CL-600-1A11 CL-600-2A12, CL-600-2B16
CL604	CL60	CL-604	CL-600-2B16
BD100	CL30	CHALLENGER 300	ALL SERIES
BD700	GL5T	GLOBAL 5000	ALL SERIES
CONC	CONC	CONCORDE	ALL SERIES
DC10	DC10	DC-10	10, 10F, 15, 30, 30F, 40, 40F
DC86-7	DC86, DC87	DC-8	62, 62F, 72, 72F
DC93	DC93	DC-9	30, 30F
DC95	DC95	DC-9	SERIES 51

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Monitoring Group	ICAO Designator	A/C Type	A/C Series
E135-145	E135, E145	EMB-135, EMB-145	ALL SERIES
E170, E190	E170, E190	EMBRAER 170, 175, 190, 195	ALL SERIES
F100	F100	FOKKER 100	ALL SERIES
F2TH	F2TH	FALCON 2000	ALL SERIES
F70	F70	FOKKER 70	ALL SERIES
F900	F900	FALCON 900, FALCON 900EX	ALL SERIES
FA10	FA10	FALCON 10	ALL SERIES
FA20	FA20	FALCON 20 FALCON 200	ALL SERIES
FA50	FA50	FALCON 50, FALCON 50EX	ALL SERIES
GALX	GALX	1126 GALAXY	ALL SERIES
GLEK	GLEK	BD-700 GLOBAL EXPRESS	ALL SERIES
GLF2	GLF2	GULFSTREAM II (G-1159),	ALL SERIES
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	ALL SERIES
GLF3	GLF3	GULFSTREAM III (G-1159A)	ALL SERIES
GLF4	GLF4	GULFSTREAM IV (G-1159C)	ALL SERIES
GLF5	GLF5	GULFSTREAM V (G-1159D)	ALL SERIES
H25B-700	H25B	BAE 125 / HS125	700B
H25B-800	H25B	BAE 125 / HAWKER 800XP, BAE 125 / HAWKER 800, BAE 125 / HS125	ALL SERIES/A, B/800
H25C	H25C	BAE 125 / HAWKER 1000	A , B
IL86	IL86	IL-86	NO SERIES
IL96	IL96	IL-96	M , T, 300
J328	J328	328JET	ALL SERIES
L101	L101	L-1011 TRISTAR	1 (385-1), 40 (385-1), 50 (385-1), 100, 150 (385-1-14), 200, 250 (385-1-15), 500 (385-3)
L29B-2	L29B	L-1329 JETSTAR 2	ALL SERIES
L29B-731	L29B	L-1329 JETSTAR 731	ALL SERIES
LJ31	LJ31	LEARJET 31	NO SERIES, A
LJ35/6	LJ35 LJ36	LEARJET 35 LEARJET 36	NO SERIES, A
LJ40	LJ40	LEARJET 40	ALL SERIES
LJ45	LJ45	LEARJET 45	ALL SERIES
LJ55	LJ55	LEARJET 55	NO SERIES B, C
LJ60	LJ60	LEARJET 60	ALL SERIES

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Monitoring Group	ICAO Designator	A/C Type	A/C Series
MD10	MD10	MD-10	ALL SERIES
MD11	MD11	MD-11	COMBI, ER, FREIGHTER, PASSENGER
MD80	MD81, MD82, MD83, MD87, MD88	MD-80	81, 82, 83, 87, 88
MD90	MD90	MD-90	30, 30ER
P180	P180	P-180 AVANTI	ALL SERIES
PRM1	PRM1	PREMIER 1	ALL SERIES
T134	T134	TU-134	A, B
T154	T154	TU-154	A , B, M, S
T204	T204, T224, T234	TU-204, TU-224, TU-234	100, 100C, 120RR, 200, C
YK42	YK42	YAK-42	ALL SERIES

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE**



ASIA/PACIFIC REGIONAL IMPACT STATEMENT

***RVSM GLOBAL LONG TERM HEIGHT MONITORING
REQUIREMENTS EFFECTIVE FROM NOVEMBER 2010***

Version 1.0 – September 2009

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

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FOREWORD

Since the initial operational implementation of Reduced Vertical Separation Minimum (RVSM) in the North Atlantic in 1997, widespread implementation of RVSM has taken place globally. In the Asia/Pacific Region, implementation commenced as a result of the output of the Third Asia/Pacific Regional Air Navigation Meeting (RAN/3, Bangkok, Thailand, 19 April – 7 May 1993) which called for an ICAO RVSM Task Force to progress RVSM implementation in the Pacific. The Ninth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG 9, August 1998) established the Asia/Pacific RVSM Implementation Task Force (RVSM/TF) under the terms of Decision 9/4 and simultaneously adopted Conclusion 9/3 requiring actions to establish an RVSM implementation schedule for the Asia region, in addition to the programme for the Pacific region.

Under the capable stewardship of the RVSM/TF, Asia/Pacific RVSM implementations went forward smoothly commencing with the Pacific area in 2000 and followed by the Western Pacific and South China Sea area during 2002, the Bay of Bengal area in 2003, Japan and the Republic of Korea during 2005 and throughout the airspace of China in 2007. RVSM implementations in the two remaining Asia/Pacific FIRs, Pyongyang and Ulaan Baatar, are scheduled for 2009 and 2012, respectively.

Recognising the significance of the step from a 2000 ft vertical separation minimum to a 1000 ft vertical separation minimum, intensive monitoring arrangements were put in place to ensure the continued safety of RVSM operations. Such monitoring considers RVSM safety performance in terms of two components. Technical risk relates to the technical performance of equipment, including altimetry systems. Operational risk relates to human performance error and, in simple terms, considers errors made by pilots and air traffic controllers.

To be approved for operation in RVSM airspace, States must ensure that aircraft comply with technical requirements that enable the actual height cleared by air traffic services to be accurately maintained. The RVSM monitoring programmes around the world have collected extensive height keeping data to determine the stability of Altimetry System Error (ASE) in airframes used for RVSM operations. The results show that ASE drift is worse than anticipated. Accordingly, provisions have recently been included in Annex 6 – *Operation of Aircraft* that take effect from 2010 and require the global long term monitoring of altimetry systems used for RVSM operations.

APANPIRG/20 (September 2009) has adopted this Asia/Pacific Regional Impact Statement, prepared by the Regional Airspace Safety Monitoring Advisory Group (RASMAG), under the terms of Conclusion 20/23 to provide general guidance to States. Additionally, specific guidance is provided to assist in identifying the ground-based monitoring infrastructure necessary for the regional RVSM monitoring programme, in order that States are better informed when making collaborative decisions about investments in regional infrastructure.

1. Introduction

1.1 At the broadest level, Annex 11 – *Air Traffic Services* requires States to establish a safety programme in order to achieve an acceptable level of safety in the provision of Air Traffic Services (ATS). More specific requirements exist for the implementation of safety management systems by Air Navigation Services Providers (ANSPs) that identify hazards, ensure remedial action and provide for the continuous monitoring and regular assessment of the safety level achieved.

1.2 In the specific case of the implementation and ongoing operation of reduced vertical separation minimum (RVSM), Annex 11 requires that for all airspace where a RVSM of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the implementation and continued application of this reduced vertical separation minimum meets the safety objectives. Annex 11 also requires that the coverage of the height-monitoring facilities provided under this programme shall be adequate to permit monitoring of the relevant aircraft types of all operators that operate in RVSM airspace. Arrangements shall be put in place, through interregional agreement, for the sharing between regions of data from RVSM monitoring programmes.

1.3 The increasing complexity of requirements and the necessary State interactions led the Fourteenth meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/14, August 2003) to establish the Regional Airspace Safety Monitoring Advisory Group (RASMAG) to provide oversight of airspace safety monitoring requirements, including the monitoring of the height keeping performance of the airframes used in RVSM operations, thereby providing a regional basis for RVSM monitoring in Asia/Pacific. In further addressing its responsibilities in this regard, APANPIRG adopted a Target Level of Safety (TLS) for en-route airspace in the Asia/Pacific region of 5×10^{-9} fatal accidents per flight hour in each dimension i.e. vertical, lateral and longitudinal. APANPIRG also continues to encourage cooperative arrangements between States to undertake airspace safety assessments and to provide airspace safety assessment and monitoring for the introduction of airspace changes and reduction in aircraft separation minima (vertical and horizontal), as well as for ongoing operations.

2. The need for RVSM Monitoring

2.1 Aircraft use a barometric altimeter to determine height and follow common pressure levels (flight levels) using a QNH of 1013 in RVSM airspace. The errors in the aircraft altimetry sensing systems are not apparent during routine operations as the altimeter displays to the aircrew and air traffic services (ATS) a level that includes these altimetry system errors (ASE). As such, the presentation to the pilot and/or ATS is often different to the actual height of the aircraft. During routine calibration the aircraft systems are maintained on the ground while at rest, so the dynamic nature of ASE is not able to be seen. Aircraft altimetry systems also utilize parts that:

- wear over time (such as the pitot-static probe and portions of internal plumbing); and/or
- are subject to damage (such as skin flexing/deformation during operations); and/or
- are affected by modification of airframes (such as the application of paint, decals and branding marks or mounting of accessories or repairs such as boiler plating in the vicinity of the static pressure ports).

2.2 All these activities are capable of producing significant error in true height. Other factors seen in normal operations of high-speed flight such as aerodynamic loading and exposure to ranges of temperature, moisture and contaminants, are also capable of producing significant variation in the sensed pressure.

2.3 ASE can vary over the population of operational aircraft of the same type and within each specific aircraft this error can vary with time in service. **Figure 1** below details the variations observed in true altitude over a period of five years for a single airframe. Note the increased rate of deterioration in the last 10 months of the sample period.

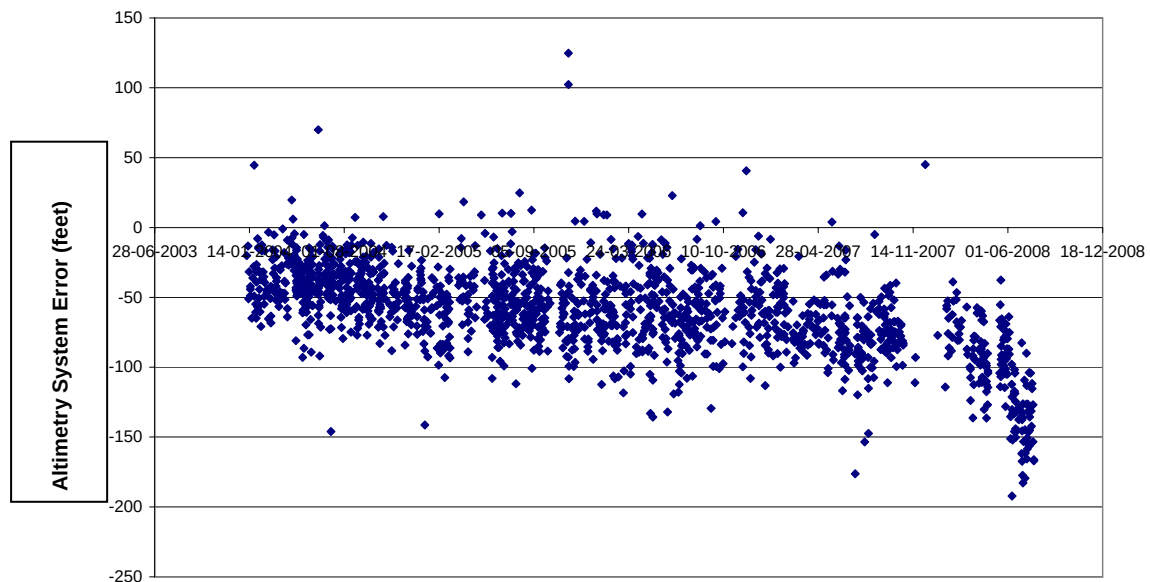


Figure 1: Example of single airframe Altimetry System Error (ASE) degradation over 5 years.

2.4 As well as the ASE variations that occur within a single airframe (as shown above), **Figure 2** below demonstrates the variation in ASE over a fleet of 15 airframes of the same type at a similar point in time.

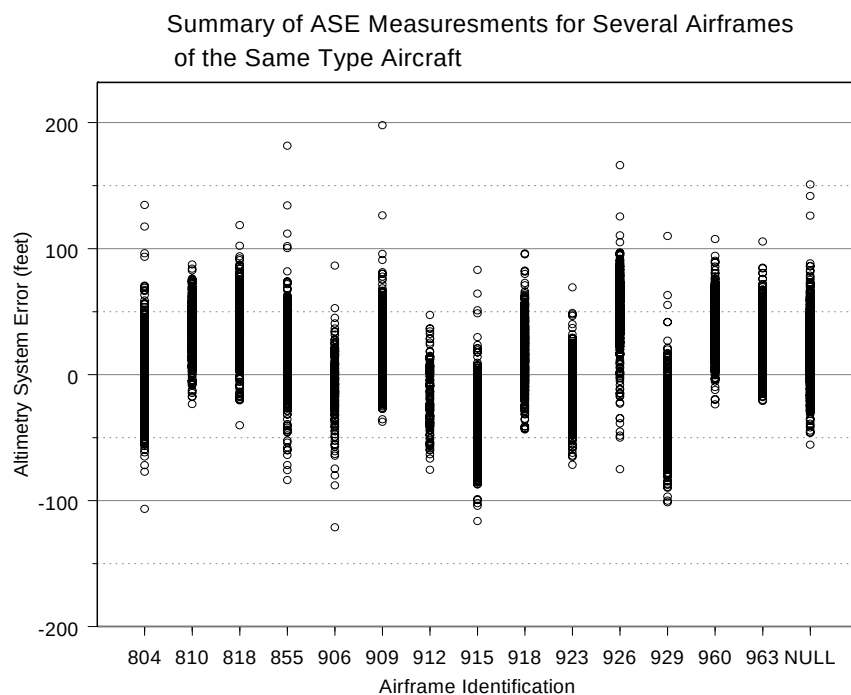


Figure 2: Variation of ASE over 15 airframes of same type at a similar point in time.

2.5 The collision risk model applied for RVSM is globally recognized by ICAO and uses an empirical basis coupled with robust mathematical methodologies to exclude height deviations of less than 300 feet for the assessment of operational errors (i.e. pilot and air traffic controller errors). However, the technical risk component of the collision risk model considers all errors in its assessment and therefore any adverse performance of individual altimetry systems must be included in the model. In an attempt to balance the need, on the one hand, for continuous assessment of the altimetry system performance of each airframe to meet mathematical principles with, on the other hand, the real-world pragmatic difficulties in actually achieving monitoring at this rate, the Annex 6 provision have been drafted accordingly. As such, in generic terms Annex 6 essentially provides for a monitoring rate of two airframes per type per operator per two years in the expectation that this will provide adequate data whilst not imposing excessively onerous requirements on operators.

2.6 Continued safe RVSM operations demand continuous high accuracy from altimetry systems, however RVSM Regional Monitoring Agencies (RMAs) globally have evidence that ASE can vary within a population of the same aircraft type at any point in time and by individual aircraft over any period of time. These concerns were identified early on in the global RVSM implementation programme and, as a consequence, monitoring requirements were incorporated in the RVSM Manual (*Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive- Doc 9574*) and Annex 11. Subsequently, because the data that became available from the monitoring clearly identified the technical problems in altimetry systems and lack of ASE stability, additional provisions were necessary in Annex 6 to ensure that global monitoring requirements were clearly defined, and amendments to Annex 11 have also been proposed by the ICAO Separation and Airspace Safety Panel (SASP) to clarify regional monitoring responsibilities. To ensure that only high accuracy altimetry systems are in operation, the new monitoring requirements required by Annex 6 – *Operation of Aircraft* need to be in place by 2010, however it clearly makes for safer operations to implement the long term height monitoring requirements without delay.

3. Asia/Pacific RVSM Monitoring arrangements

3.1 Assessment of the safety performance of RVSM airspace is undertaken by specialist assessment bodies known as Regional Monitoring Agencies (RMAs), which are specifically established to undertake the on-going monitoring of RVSM operations in order to meet ICAO Standards. For the APAC Region, APANPIRG-endorsed RMA services are provided by:

- The Australian Airspace Monitoring Agency (AAMA), operated by Airservices Australia.
- The China RMA, operated by the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC).
- The JCAB RMA, operated by the Japan Civil Aviation Bureau.
- The Monitoring Agency for the Asia Region (MAAR), operated by Aeronautical Radio of Thailand (AEROTHAI).
- The Pacific Approvals Registry and Monitoring Organization (PARMO), operated by the United States Federal Aviation Administration.

3.2 The Flight Information Regions (FIRs) for which each RMA takes responsibility have been described in the RASMAG “*List of Competent Airspace Safety Monitoring Organizations*”—a copy of which is included as Appendix A.

4. Long term RVSM height monitoring requirements

4.1 The ICAO SASP has identified that height-keeping performance monitoring results for RVSM approved aircraft had, in some cases, demonstrated long-term adverse trends in ASE stability. The likely results of this trend, if not reversed, would be aircraft becoming non-compliant with RVSM requirements. Accordingly, to ensure that adverse trends in ASE stability were detected, it was recognised by SASP that globally applicable RVSM long-term height monitoring requirements would be necessary.

4.2 As a result of proposals made by the SASP, during 2007 the ICAO Air Navigation Commission (ANC) agreed to amendments to Annex 6 – *Operation of Aircraft* that detail global RVSM long-term monitoring requirements that become effective in November 2010. These requirements state as follows:

7.2.7 The State of the Operator that has issued an RVSM approval to an operator shall establish a requirement which ensures that two aeroplanes of each aircraft type grouping of the operator have their height keeping performance monitored, at least once every two years or within intervals of 1 000 flight hours per aeroplane, whichever period is longer. If an operator aircraft type grouping consists of a single aeroplane, monitoring of that aeroplane shall be accomplished within the specified period.

4.3 Although Annex 11 has required regional RVSM monitoring programmes since 2001, as a result of the recent adoption of the Annex 6 requirements above, during May 2009 the SASP proposed a revision to Annex 11 that clarifies the regional component of RVSM monitoring. The SASP proposal is intended to retain the original long standing Annex 11 monitoring provisions whilst placing greater responsibilities on regional monitoring programmes to assist in delivering the ASE stability and aircraft group performance required by the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*. The proposal is currently under review by the ICAO Secretariat and the ANC, and proposes amendments to Annex 11 as follows:

3.3.5.1 For all airspace where a reduced vertical separation minimum of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the ~~implementation and~~ continued application of this vertical separation minimum meets the regional safety objectives. ~~The coverage of the height monitoring facilities provided under this programme shall be adequate to permit monitoring of the relevant aircraft types of all operators that operate in RVSM airspace. The scope of regional monitoring programmes shall be adequate to conduct analyses of aircraft group performance and evaluate the stability of altimetry system error.~~

~~Note. — The number of separate monitoring programmes should be restricted to the minimum necessary to effectively provide the required services for the region.~~

3.3.5.2 Arrangements shall be put in place, through inter-regional agreement, for the sharing between regions of data from monitoring programmes.

4.4 The RASMAG has considered the new requirements for long-term height monitoring in some detail, noting that the provisions will take effect from November 2010, in about a year's time. During 2008 RASMAG circulated 6 Long Term Height Monitoring Actions (Appendix B refers) for the attention of Asia/Pacific States and airspace users. Additionally, in relation to the Annex 6 and Annex 11 requirements, APANPIRG has agreed (Conclusion 20/20) that the RVSM **Minimum** Monitoring Requirements (MMRs) that had previously been adopted for use by RMAs in the Asia/Pacific Region should continue in use for the time being. Appendix C summarises the

Asia/Pacific MMRs. In recommending this conclusion to APANPIRG, RASMAG recognised that monitoring was a significant burden to operators and should be kept to the minimum necessary. RASMAG therefore agreed to continuously review monitoring results with the objective of migrating to the Annex 6 provisions as the basis for regional MMRs providing that regional safety requirements were not compromised.

4.5 APANPIRG/18 recognized that the 2010 implementation of Annex 6 global long-term monitoring requirements for airframes used in RVSM operations would have significant impacts in the way regional monitoring was managed, including the need for widespread regional height monitoring infrastructure capability to be made available. Under the terms of Conclusion 18/4, APANPIRG tasked Asia/Pacific RMAs in conjunction with RASMAG to prepare this regional impact statement summarizing the estimated consequences for the Region, including consideration of the numbers of airframes required to be monitored and ground monitoring infrastructure required.

5. Monitoring of Airframes

5.1 The implementation of long-term height monitoring requirements will place significant additional responsibilities on operators, State approval authorities and RMAs alike. Within the Asia/Pacific Region, the RMAs in conjunction with RASMAG and APANPIRG have presently standardised on a set of RVSM MMRs that do not prescribe on-going monitoring requirements after the initial monitoring of operator fleet or single aircraft type operations when an RVSM operational approval is sought by the operator. However, the Annex 6 provisions specifically require on-going monitoring and, as a result, the current Asia/Pacific MMRs will need to be reviewed to incorporate, to the extent possible, the monitoring periodicity requirements on Annex 6.

5.2 For the purposes of this assessment in determining the monitoring requirement after November 2010, the Asia/Pacific RMAs have provided approximate numbers of airframes based on the criteria set in Annex 6. As a result, the total number of airframes to be monitored over the 2 year period ending November 2012 (termed the “monitoring burden”) is expected to be about 1385 airframes, a subset of the approximately 7275 airframes operating in the region. A detailed breakdown of this analysis is provided in Appendix D. It should be noted that the number of airframes to be monitored is likely to increase over the medium term as older, non-RVSM capable aircraft are replaced with more modern types with RVSM capability.

6. Ground-Based Monitoring Infrastructure

6.1 The implementation of long-term height monitoring will require significant changes in the monitoring infrastructure to ensure the requirements of Annex 6 are met. Currently within the Asia/Pacific Region, airframe monitoring is undertaken by means of either a ground-based system or a portable unit temporarily mounted in the aircraft.

6.2 In the case of ground-based systems, monitoring is undertaken by aircraft flying in proximity to the Height Monitoring Units (HMUs) in Europe or in North America (where they are known as Aircraft Geometric Height Measurement Elements -AGHMEs) to estimate aircraft ASE. Three HMUs are managed by Eurocontrol, one by the North Atlantic Central Monitoring Agency (NAT CMA), and six AGHMEs by the Pacific Approvals Registry and Monitoring Agency (PARMO) - four in the United States and two in Canada. Ground-based monitoring by these systems is effective only for Asia/Pacific based aircraft operated internationally to those continents and for new aircraft from the major manufacturers.

6.3 In practice, ground-based monitoring can only occur when an aircraft overflies – in level flight - a ground-based monitoring unit or transits the local airspace specifically associated with the unit. This is not convenient in all cases as operators may have to vary flight patterns to overfly an HMU. Therefore ground-based monitoring units should ideally be located at points that are routinely overflown by aircraft engaged in normal scheduled operations, rather than at locations that require

aircraft to divert from normal flight paths in order to overfly the ground monitoring unit.

6.4 At present, with the exception of those in the continental United States, there are no operational ground-based monitoring facilities in the Asia/Pacific region.

6.5 The portable GPS Monitoring Unit (GMU) is a carry-on system installed in an aircraft for a single flight. Its main advantage is the ability to monitor an individual aircraft during normal operations without the need to fly over a ground-based monitoring system in a particular portion of airspace. Data files from a GMU must be post-processed to extract aircraft geometric height which must then be combined with other information in order to produce height keeping performance data. GMUs are used by the US FAA, AEROTHAI, ATMB of CAAC and one or two other approved service providers in conjunction with the FAA Technical Center. GMU monitoring is coordinated by RMAs or State approval authorities; it is widely used and effective. However, it can be costly and inconvenient to operators: there are charges for the use of the unit, and its installation and subsequent removal may involve time out of service for the aircraft.

6.6 In recent times the SASP has been progressing work to prove the acceptability of the geometric height data available in ADS-B messages as a cost effective means of monitoring ASE stability. Significant trials undertaken by the FAA in the United States have produced good results and in particular, the Australian Airspace Monitoring Agency (AAMA) operating through Airservices Australia is keen to progress this work given its wide-coverage ADS-B surveillance network and the cost effectiveness of such a system. However, using ADS-B data alone to monitor aircraft ASE will not provide a complete sample of the airspace population unless a mandated ADS-B fitment requirement exists in a particular Region or State. In Australia, for example, such a mandate will become effective in 2013 for all civil aircraft operating above Flight Level 280, but this is not yet the case in most areas of the Asia/Pacific region.

6.7 The advantage of ground-based monitoring systems (HMUs, AGHME or ADS-B) is that they provide large volumes of data and information about the aircraft population and permit repeated measurements on individual airframes, which is highly beneficial in detecting trends in ASE performance. The location of the ground-based monitoring system is very important, as it determines the number of aircraft for which ASE estimates will be produced and further consideration of this issue will need to be undertaken by RASMAG in conjunction with APANPIRG and Asia/Pacific States.

6.8 The advantage of a portable airborne system (GMU) is that it provides the ability to target specific portions of the airspace population to meet immediate needs, however GMU monitoring does not provide the continuous data streams necessary to determine aircraft group performance and ASE stability. Therefore although GMU monitoring addresses the basic MMR, it should be considered only as supplementary to ground-based monitoring.

6.9 Importantly, it should be recognised that the Asia/Pacific States have a large number of aircraft that confine their operations to single State or Regional environments and therefore would rarely be able to benefit from post-initial approval monitoring by the ground-based units in Europe and North America. This is particularly relevant in the cases of Australia, China, India and Indonesia, which have large domestic fleets that are not used for international operations. Of the approximately 1385 airframes required to be monitored regionally over the 2 year period ending November 2012, it is estimated that less than nine percent (9 %) will have access to the European, Canadian or United States ground-based monitoring installations during scheduled services.

6.10 Accordingly, a complete monitoring programme for the Asia/Pacific region should make provision for a combination of ground-based monitoring systems such as the HMU, AGHME and, if acceptable in the future, ADS-B as well as airborne systems such as the GMU. However, recognising the cost of installing, operating and maintaining such systems, regional investment should be kept at the absolute minimum necessary to meet the operational requirements. Since the use of

ADS-B systems for height monitoring is still under development and it will be some time before ADS-B is usable as a monitoring alternative, currently proven ground-based monitoring systems will need to be deployed in the Asia/Pacific region as the initial response to the long-term monitoring requirements. Deployment of these systems needs to be closely coordinated with APANPIRG, RASMAG and the Asia/Pacific RMAs to ensure effective monitoring within the Region whilst avoiding unnecessary investment in dedicated monitoring infrastructure.

7. Impacts on the Asia/Pacific Region

Objectives of height monitoring

7.1 In considering both the impact of the Annex 6 provisions and the proposed strengthening of Annex 11 regional provisions on the Asia/Pacific Region, an understanding of the objectives to be achieved by height monitoring is necessary. At the broadest level, the monitoring programme must ensure that the continued operational application of RVSM meets the established safety requirements.

7.2 In order to achieve this primary objective, three subsidiary objectives must be met for the performance monitoring of RVSM. The first is to ensure compliance with a basic RVSM Minimum Monitoring Requirement. The MMR serves as a check that operators have initially made any required airframe changes and then continue to maintain aircraft in accordance with manufacturer's recommendations for airworthiness. For this purpose, only a sample of observations from each of the operators' fleets is required and Annex 6 provisions require the monitoring at intervals of no more than two years.

7.3 The second objective is to conduct analyses of aircraft group performance, where a group consists of aircraft with nominally identical design (including nominally identical static systems and RVSM-related avionics units) as defined in Chapter 4 of the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)* and recognised in the strengthened draft Annex 11 provisions presently under consideration. In achieving this objective, a much larger data sample adequate to determine ASE performance is required. Accordingly, enough ASE monitoring data should be captured to be able to assess every monitoring group against RVSM performance requirements routinely throughout the two-year period.

7.4 The final objective requires that in order to fulfil the system performance monitoring required by Chapter 6 of the *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*, and as recognised in the strengthened draft Annex 11 provisions presently under consideration, the monitoring process should also aim to provide evidence of ASE stability. Sufficient ASE performance data must be available to show that, for the bulk of airframes circulating in the RVSM environment, ASE performance does not vary substantially from the beginning to the end of the two-year monitoring period. Such data is obtained from repeated samples on individual airframes throughout the two-year period.

Portable and ground-based monitoring

7.5 In terms of meeting the basic MMR, monitoring completed using a portable GMU is acceptable. However, to assess aircraft group performance and long-term ASE stability, large volumes of data are necessary, including results of monitoring of the same airframes over a period of time. Such large volumes of data are only obtainable from ground-based monitoring installations that are regularly overflown by the relevant airframes. Accordingly, a regional monitoring infrastructure that provides the ability to meet the basic MMR requirements as well as the group performance and ASE stability monitoring requirements is necessary. This involves a mixture of portable GMU and ground-based monitoring capability used in a continuous and well coordinated manner.

Current Asia/Pacific monitoring capabilities

7.6 At present, there are no ground-based monitoring installations operating in the Asia/Pacific region. Such facilities are available in some other areas of the world visited regularly by aircraft based in the Asia/Pacific region, and some monitoring results are available to be shared between RMAs on a global basis.

7.7 Limited portable GMU monitoring capability is available via Asia/Pacific RMAs - as described in paragraph 6.5 above.

Appropriate ground-based monitoring locations

7.8 Clearly, in a region of the size of the Asia/Pacific it is not at all feasible to provide 100% monitoring capabilities in all areas. However, a review of the major international traffic flows (see Appendix E) suggests that appropriate locations for installation of ground-based monitoring systems could include Australia/New Zealand, Southeast Asia, Northeast Asia, China and India/Pakistan. The availability of ground-based monitoring capabilities in these five areas would adequately serve the majority of international traffic flows, whilst also catering for the disposition and monitoring of the larger domestic fleet operations in Australia, China and India. Adoption of such a ground-based infrastructure could mean that existing regional portable GMU capability is adequate. However, the absence of suitable ground-based infrastructure means that investment in GMU capabilities will be necessary.

7.9 In relation to a ground-based unit in northeast Asia, Japan is already advanced with planning to install three ground-based height monitoring units (HMUs) in the Japanese airspace (i.e. Fukuoka FIR). The first HMU is targeted to commence operations in the second quarter of 2011, the second and the third HMUs will come on stream in the second quarter of 2012.

Coordination arrangements

7.10 In an effort to minimise duplications of effort whilst still ensuring compliance with monitoring provisions, effective coordination between RMAs globally, and between RMAs and the States they are serving, is essential. Each Asia/Pacific RMA should examine monitoring results accumulated by all other authorized global RMAs, regardless of region, in order to utilize monitoring results from other regions to avoid duplication and reduce the actual monitoring burden faced by each RMA and operator.

7.11 APANPIRG has already recognised the importance of coordination between RMAs and States, with APANPIRG/19 (September 2008) promulgating the following Conclusion:

Conclusion 19/15 – Enhanced communications between States and RVSM RMAs

That, noting the Annex 6 provisions for the global long term monitoring of airframes used in RVSM operations and the critical role of Asia/Pacific RVSM Regional Monitoring Agencies (RMAs) in monitoring the safety of RVSM operations, the Regional Office draw the attention of States to the Long Term Height Monitoring Actions promulgated by RASMAG. In particular, States are encouraged to immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs.

7.12 Despite Conclusion 19/15, Asia/Pacific RMAs continue to experience difficulties in receiving timely and accurate information (including routine large height deviation [LHD] reporting) from States. In order to enable RMAs to assist States to fulfil their monitoring obligations, it is necessary that States:

- a) continuously update RMA databases of operators and aircraft holding State RVSM approvals;
- b) enable the expeditious forwarding of all LHD and related reports to RMAs, and
- c) ensure availability of current details for State RVSM Point of Contact (POC) officials.

7.13 To highlight the importance of data provision, APANPIRG/20 adopted Conclusion 20/22 calling for States to provide an update of RVSM approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4. In the event that adequate compliance with coordination arrangements is not achieved, RASMAG recommends that APANPIRG place non compliant States on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields.

8. Conclusions

8.1 The Annex 6 requirements for RVSM long-term height monitoring that take effect from November 2010 will have a significant impact on the way in which such monitoring will be undertaken in the Asia/Pacific region. The RASMAG, in conjunction with the Asia/Pacific RMAs, has determined a probable monitoring burden of approximately 1385 airframes region-wide in the 2 years ending November 2012 and the existing Asia/Pacific RVSM Minimum Monitoring Requirements will need to be reviewed against the amended ICAO documentation.

8.2 Three primary objectives need to be achieved in terms of RVSM height monitoring:

- a) Compliance with a basic Minimum Monitoring Requirement (MMR - e.g. two aircraft per type, per operator, per two years),
- b) Conduct of analyses of aircraft group performance, and
- c) Evaluation of the stability of altimetry system error.

8.3 Achievement of the first objective is via sampling of relatively few airframes at relatively long intervals. Achievement of the other two objectives requires large volumes of data obtained via repeated sampling of airframes over extended periods of time using ground-based monitoring equipment.

8.4 Additional monitoring infrastructure will need to be deployed in the Asia/Pacific Region. A range of proven monitoring systems is currently available, including ground-based fixed installation HMUs and AGHMEs and portable airborne GMUs. A mix of ground-based and portable GMU capability will be required. Although the use of ADS-B for height monitoring purposes is currently under development with trials to date showing encouraging results, it is expected to be some time before ADS-B provides a practical monitoring capability.

8.5 Monitoring conducted using portable GMU equipment achieves a single monitoring result on each occasion that is suitable for compliance with basic MMRs, however the large volumes of data necessary for evaluation of the group performance of aircraft and stability of altimetry systems

can only be obtained by frequent monitoring using ground-based monitoring installations.

8.6 Ground-based monitoring can only occur when an aircraft overflies – in level flight - a ground-based monitoring unit or transits the local airspace specifically associated with the unit. Therefore ground-based monitoring units should ideally be located at points that are routinely overflowed by aircraft engaged in normal scheduled operations, rather than at locations that require aircraft to divert from normal flight paths in order to overfly the ground monitoring unit.

8.7 States retain responsibility for compliance with Annex provisions, including those relating to RVSM height monitoring. An extensive system of APANPIRG approved RMAs has been established in the Asia/Pacific region to assist States in this regard, provided States make the necessary data continuously available to RMAs and comply with relevant RMA requirements. Arrangements have been implemented between global RMAs to enable sharing of monitoring data.

8.8 However, within the Asia/Pacific Region, present coordination activities by States with their respective RMAs are not adequate. States will be required to comply with related APANPIRG Conclusions, including Conclusions 19/15 and 20/22, and immediately strengthen relationships with their respective RMAs to ensure that information in relation to RVSM approval status is continuously available to RMAs. Should voluntary compliance not be effective, RASMAG recommends that APANPIRG place non-compliant States on the APANPIRG List of Deficiencies in the ATM/AIS/SAR Fields.

8.9 A review of the major international traffic flows suggests that appropriate locations for installation of ground-based monitoring systems could include Australia/New Zealand, Southeast Asia, Northeast Asia, China and India/Pakistan. The availability of ground-based monitoring capabilities in these five areas would adequately serve the majority of international traffic flows, whilst also catering for the disposition and monitoring of the larger domestic fleet operations in Australia, China and India. Adoption of such a ground-based infrastructure could mean that existing regional portable GMU capability is adequate. However, the absence of suitable ground-based infrastructure means that investment in GMU capabilities will be necessary.

8.10 Japan has already indicated its intention to deploy three HMUs situated within the airspace of Japan, with the first HMU targeted to become operational in 2011.

8.11 APANPIRG, in close coordination with RASMAG and Asia/Pacific RMAs will need to be involved in recommending the types and appropriate locations of monitoring systems to most effectively monitor the Asia/Pacific aircraft population with the least infrastructure investment.

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References:

- The RVSM Manual – *Manual on Implementation of a 300 m (1000 ft) Vertical Separation Minimum between FL290 and FL410 Inclusive (Doc 9574)*;
- The draft ICAO Regional Monitoring Agency (RMA) Manual - *Manual of Operating Procedures and Practices for Regional Monitoring Agencies in relation to the use of a 300 m (1 000 ft) Vertical Separation Minimum above FL 290*;
- Annex 11 – *Air Traffic Services*;
- Annex 6 – *Operation of Aircraft*;
- PANS-ATM, Doc 4444 - *Procedures for Air Navigation Services – Air Traffic Management*;
- APANPIRG Conclusions 17/4, 18/2, 18/3, 18/4, 19/15, 20/22 and 20/23;
- Regional Office State Letter AP018/8 of 31 January 2008; and
- Reports of the Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG/9 – May 2008, RASMAG/10 – December 2008, RASMAG/11 – June 2009)

APPENDIX A

APANPIRG Asia/Pacific Airspace Safety Monitoring

RASMAG LIST OF COMPETENT AIRSPACE SAFETY MONITORING ORGANIZATIONS

The Regional Airspace Safety Monitoring Advisory Group of APANPIRG (RASMAG) is required by its terms of reference to recommend and facilitate the implementation of airspace safety monitoring and performance assessment services and to review and recommend on the competency and compatibility of airspace monitoring organizations. In order to assist in addressing these requirements, RASMAG updates and distributes the following list of competent airspace safety monitoring organizations for use by States requiring airspace safety monitoring services. In the context of the list, abbreviations have meanings as follows:

- RMA – Regional Monitoring Agency – safety assessment and monitoring in the vertical plane (i.e. RVSM);
- EMA – En-route Monitoring Agency – safety assessment and monitoring in the horizontal plane (i.e. RHSM, RNAV10, RNP4);
- CRA – Central Reporting Agency – technical performance of data link systems (i.e. ADS/CPDLC); and
- FIT – FANS 1/A Interoperability/Implementation Team – parent body to a CRA.

(last updated 12 June 2009)

Organisation <i>(including contact officer)</i>	State	Competency	Status	Airspace assessed (FIRs)
Australian Airspace Monitoring Agency (AAMA) - Airservices Australia Mr Robert Butcher, Operational Analysis Manager, Safety and Environment Group, email robert.butcher@airservicesaustralia.com	Australia	APANPIRG RMA	Current	Brisbane, Honiara, Jakarta, Melbourne, Nauru, Port Moresby and Ujung Pandang FIRs.
		EMA	Current	Brisbane, Melbourne FIRs.

Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
China RMA - Air Traffic Management Bureau, (ATMB) of Civil Aviation Administration of China (CAAC) Mr. Tang Jinxiang, Engineer of Safety and Monitoring Technical Group, ATMB e-mail: tangjx@adcc.com.cn	China	APANPIRG RMA	Current	Beijing, Guangzhou, Kunming, Lanzhou, Shanghai, Shenyang, Urumqi and Wuhan FIRs and Sector 01 (airspace over Hainan Island) of the Sanya FIR, Pyongyang.
JCAB RMA - Japan Civil Aviation Bureau Mr. Kazunaga Suzuki, Special Assistant to the Director, Flight Procedures and Airspace Program Office email suzuki-k22z@mlit.go.jp	Japan	APANPIRG RMA	Current	Fukuoka FIR
		EMA	Available fourth quarter – 2009	Fukuoka FIR
Monitoring Agency for the Asia Region (MAAR) – Aeronautical Radio of Thailand LTD Mr. Nuttakajorn Yanpirat, Executive Officer, Systems Engineering, Aeronautical Radio of Thailand Ltd. email: nuttakajorn.ya@aerothai.co.th	Thailand	APANPIRG RMA	Current	Bangkok, Kolkatta, Chennai, Colombo, Delhi, Dhaka, Hanoi, Ho Chi Minh, Hong Kong, Karachi, Kathmandu, Kota Kinabalu, Kuala Lumpur, Lahore, Male, Manila, Mumbai, Phnom Penh, Sanya FIR, Singapore, Taipei, Ulaan Bataar, Vientiane, Yangon FIRs

Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
Pacific Approvals Registry and Monitoring Organization (PARMO) – Federal Aviation Administration (US FAA) Mr. Dale Livingston, Manager, Separation Standards Analysis Team, FAA email: dale.livingston@faa.gov	USA	APANPIRG RMA	Current	Anchorage Oceanic, Auckland Oceanic, Incheon, Nadi, Oakland Oceanic, Tahiti FIRs
		EMA	Current	Anchorage Oceanic, Oakland Oceanic
South East Asia Safety Monitoring Agency (SEASMA) - Civil Aviation Authority of Singapore (CAAS) Mr. Kuah Kong Beng, Chief Air Traffic Control Officer email: KUAH_Kong_Beng@caas.gov.sg	Singapore	EMA for South China Sea	Current	Hong Kong, Ho Chi Minh, Kota Kinabalu, Kuala Lumpur, Manila, Sanya and Singapore FIRs
FIT - SEA ICAO Regional Office email icao_apac@bangkok.icao.int & CRA Japan Mr. Mitsuo Hayasaka, Deputy Director, Air Traffic Control Association Japan, email: hayasaka@atcaj.or.jp	ICAO Regional Office & CRA Japan	FIT & CRA	Current	South China Sea FIRs

Organisation (including contact officer)	State	Competency	Status	Airspace assessed (FIRs)
IPACG/FIT Mr. Takahiro Morishima, JCAB Co-Chair email: morishima-t2zg@mlit.go.jp & Mr. Reed Sladen, FAA Co-Chair email reed.b.sladen@faa.gov	Japan & USA	FIT & CRA	Current	North & Central Pacific (Oceanic airspace within Fukuoka FIR, and Anchorage & Oakland FIRs)
CRA Japan Mr. Masahisa Hayashi, Deputy Director, Air Traffic Control Association Japan, email: hayashi@atcaj.or.jp	Japan	CRA	Current	Fukuoka FIR for IPACG/FIT Ho Chi Minh, Manila, Singapore FIRs for FIT-SEA
FIT - BOB ICAO Regional Office email icao_apac@bangkok.icao.int & Mr. Bradley Cornell, Boeing Engineering email Bradley.D.Cornell@Boeing.Com	ICAO Regional Office & Boeing USA	FIT & CRA	Current	Bay of Bengal FIRs, Ujung Pandang and Jakarta FIRs, provides assistance to the members of the Arabian Sea/Indian Ocean ATS Coordination Group (ASIOACG)
ISPACG/FIT Mr. Bradley Cornell, Boeing Engineering email Bradley.D.Cornell@Boeing.Com	Boeing USA	FIT & CRA	Current	South Pacific FIRs and members of the Informal South Pacific ATS Coordination Group (ISPACG)

RASMAG Long Term RVSM Height Monitoring Actions – Asia/Pacific Region

APANPIRG/18 (September, 2007) was of the opinion that work should be undertaken as soon as possible in order to assess the consequences for the Asia/Pacific Region of the implementation of ICAO global long term RVSM height monitoring requirements from 2010 and, under the terms of Conclusion 18/4, requested Asia/Pacific Regional Monitoring Agencies (RMAs) in conjunction with the APANPIRG Regional Airspace Safety Monitoring Advisory Group (RASMAG) to prepare a regional impact statement summarizing the estimated consequences for the Region, including consideration of the numbers of airframes required to be monitored.

In order to progress these matters in a timely fashion, RASMAG/8 (December, 2007) formulated six Long Term Height Monitoring (LTHM) Actions for promulgation, as outlined below. More details in respect to each LTHM Action can be found in the RASMAG/8 report, available from the website of the ICAO Asia/Pacific Office at <http://www.bangkok.icao.int/> under the “Meetings” menu.

LTHM Action 1: Based on the final draft of the RMA Manual which was expected to be available from June 2008, Asia/Pacific RMAs in conjunction with RASMAG prepare and widely promulgate an information circular detailing, as a minimum, the roles and responsibilities of an RMA, the height monitoring process and equipment required, and the reasons and quantum of the global long term height monitoring requirements.

LTHM Action 2: To maintain effective delivery of existing RMA services and facilitate planning specifically designed to prepare for application of global long-term RVSM height monitoring requirements from 2010, each Asia/Pacific RMA should, as a matter of priority, bring to the attention of State regulators the difficulties being experienced by RMAs in receiving timely and accurate information (including routine large height deviation [LHD] reporting) from States. Asia/Pacific RMAs should seek assistance from States in implementing robust processes to:

- a) continuously update RMA databases of operators and aircraft holding State RVSM approvals;
- b) enable the expeditious forwarding of all LHD and related reports to RMAs, and
- c) ensure availability of current details for State RVSM Point of Contact (POC) officials.

LTHM Action 3: Whilst recognizing that responsibility for compliance with Annex 6 height monitoring provisions remains the responsibility of States, as soon as practicable each Asia/Pacific RMA, in conjunction with State regulatory authorities and airspace user organizations, should develop a methodology for reviewing the RMA database of RVSM approvals in order to develop and promulgate a list of the minimum height monitoring which must be accomplished by each operator to which the RMA provides services. In preparing this list, account should be taken of special circumstances pertaining to infrequent airspace users recognizing that some operators may be required to complete minimum monitoring requirements which are a function of the proposed 1,000-flying-hour limit rather than the two-year limit.

LTHM Action 4: After determining the potential monitoring burden posed by the operators to which it provides service, each Asia/Pacific RMA should examine monitoring results accumulated by all other authorized global RMAs, regardless of region, in order to utilize monitoring results from other regions to avoid duplication and reduce the actual monitoring burden the RMA faces.

LTHM Action 5: Each Asia/Pacific Region RMA should, in light of its anticipated height monitoring burden, propose recommendations through RASMAG to APANPIRG useful in determining the regional ground-based and GPS-based Monitoring System (GMS) height monitoring infrastructure necessary to enable its affiliated operators to meet the global long-term RVSM monitoring requirements applicable from November 2010.

LTHM Action 6: Asia/Pacific RMAs collaboratively investigate the technical feasibility of using the aircraft geometric height produced by ADS-B and Multilateration surveillance systems to support monitoring of aircraft height keeping performance.

SUMMARY OF ASIA/PACIFIC RVSM MINIMUM MONITORING REQUIREMENTS (MMRs):

1. UPDATE OF MONITORING REQUIREMENTS TABLE AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When the table is updated, a letter will be distributed to States and operators. The updated table will be posted on the websites of the APAC Regional Monitoring Agencies (RMAs) on behalf of the International Civil Aviation Organization (ICAO) Asia-Pacific Regional Planning Group (APANPIRG).
2. INITIAL MONITORING. All operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring programme. The attached table of monitoring requirements establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must include a plan that demonstrates the process that will be used to meet the applicable initial monitoring requirements.
3. AIRCRAFT STATUS FOR MONITORING. Aircraft engineering work that is required for the aircraft to receive RVSM airworthiness approval must be completed prior to the aircraft being monitored. Any exception to this rule shall be coordinated with the State authority.
4. APPLICABILITY OF MONITORING FROM OTHER REGIONS. Monitoring data obtained in conjunction with RVSM monitoring programmes from other regions can be used to meet Asia/Pacific monitoring requirements. Asia/Pacific RMAs have access to monitoring data from other regions and will coordinate with States and operators to inform them on the status of individual operator monitoring requirements.
5. MONITORING PRIOR TO THE ISSUE OF RVSM OPERATIONAL APPROVAL IS NOT A REQUIREMENT. Operators should submit monitoring plans to the responsible civil aviation authority that show how they intend to meet the requirements specified in the attached table. Monitoring will be carried out in accordance with this table.
6. AIRCRAFT GROUPS NOT LISTED IN THE TABLE. Contact the RMA responsible for the State of registration for clarification if an aircraft group is not listed in the Minimum Monitoring Requirements table or for clarification of other monitoring related issues. An aircraft group not listed in the table below will probably be subject to Category 2 monitoring requirements.
7. TABLE OF MONITORING GROUPS. A table of monitoring groups is provided as an appendix to this Minimum Monitoring Requirements document. The table shows the aircraft types and series that are grouped together for operator monitoring purposes.
8. TRAILING CONE DATA. Altimetry System Error estimations developed using Trailing Cone data collected during RVSM certification flights can be used to fulfill monitoring requirements. It must be documented that aircraft RVSM systems were in the approved RVSM configuration for the flight.
9. MONITORING OF AIRFRAMES THAT ARE RVSM COMPLIANT ON DELIVERY. If an operator adds new RVSM compliant airframes of a type for which it already has RVSM operational approval and has completed monitoring requirements for the type in accordance with the attached table, the new airframes are not required to be monitored. If an operator adds new RVSM compliant airframes of an aircraft type for which it has NOT previously received RVSM operational approval, then the operator should complete monitoring in accordance with the attached tables.
10. FOLLOW-ON MONITORING. Monitoring is an on-going program that will continue indefinitely after the RVSM approval process. A follow-on sampling program for additional operator aircraft will be coordinated by the Asia-Pacific Regional Airspace Safety Monitoring Advisory Group (RASMAG).

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE, HOWEVER, IT IS NOT REQUIRED TO BE COMPLETED PRIOR TO OPERATIONAL APPROVAL

MONITORING CATEGORY		AIRCRAFT TYPE	MINIMUM OPERATOR MONITORING FOR EACH AIRCRAFT GROUP
1	Group approved <u>and</u> monitoring data indicates performance in accordance with RVSM standards. Group Definition: aircraft have been manufactured to a nominally identical design and build and for RVSM airworthiness approval fall into a group established in an RVSM certification document (e.g., Service Bulletin, Supplemental Type Certificate, Type Certificate Data Sheet).	[A30B, A306], [A312 (GE), A313 (GE)], [A312 (PW), A313 (PW)], A318, [A319, A320, A321], [A332, A333], [A342, A343], A344, A345, A346 B712, [B721, B722], [B733, B734, B735], B737(Cargo), [B736, B737/BBJ, B738/BBJ, B739], [B741, B742, B743], B74S, B744 (5" Probe), B744 (10" Probe), B752, B753, [B762, B763], B764, B772, B773 CL60(600/601), CL60(604), C560, [CRJ1, CRJ2], CRJ7, DC10, [E135, E145], [E170, E190], F100, GLF4, GLF5, LJ60 L101, MD10, MD11, MD80 (All series), MD90	Two airframes from each fleet* of an operator to be monitored as soon as possible but not later than 6 months after the issue of RVSM operational approval <i>* Note. For the purposes of monitoring, aircraft within brackets [] may be considered as belonging to the same monitoring group. For example, an operator with six A332 and four A333 aircraft may monitor one A332 and one A333 or two A332 aircraft or two A333 aircraft.</i>
2	Group approved but insufficient monitoring data collected to move aircraft to Monitoring Category 1. Group definition applies.	Other group aircraft other than those listed in Category 1 including: A124, A388, ASTR, B703, B731, B732, BE20, BE40, C500, C25A, C25B, C525, C550**, C56X, C650, C750, CRJ9, [DC86, DC87], DC93, DC95, F2TH, [FA50 FA50EX], F70, [F900, F900EX], FA20, FA10, GLF2(II), GLF(IIB), GLF3, GALX, GLEX, H25B(700), H25B(800), H25C, IL62, IL76, IL86, IL96, J328, L29(2), L29(731), LJ31, [LJ35, LJ36], LJ45, LJ55, SBR1, T134, T154, T204, P180, PRM1, YK42	60% of airframes from each fleet of an operator (round up if fractional), as soon as possible but not later than 6 months after the issue of RVSM operational approval. (*Note: If 60 percent of the fleet yields a fractional number, round up to the next whole aircraft (e.g., for a fleet of 2 aircraft, $0.6 \times 2 = 1.2$; therefore, 2 aircraft must be monitored). ** Refer to aircraft group table for detail on C550 monitoring
3	Non-Group Non-group Definition: aircraft that do not fall under the group definition <u>and</u> for RVSM airworthiness approval are presented as an individual airframe.	Non-group approved aircraft	100% of aircraft shall be monitored as soon as possible but not later than 6 months after the issue of RVSM operational approval.

Estimated RVSM Monitoring Burden for Asia/Pacific Region as a result of Long Term Height Monitoring Requirements of Annex 6 - Period from Nov 2010 to Nov 2012

(Data estimated by Asia/Pacific RVSM Regional Monitoring Agencies)

AAMA – Australian Airspace Monitoring Agency (Airservices Australia)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Australia	ANO	1	[E170, E190]	2	2
	AUZ	1	[B762, B763]	22	2
	JST	1	[A319, A320, A321]	41	2
		1	[A332, A333]	6	2
	NJS	1	B712	11	2
	OZJ	2	B732	3	2
	OZW	1	F100	8	2
	QFA	1	[A332, A333]	16	2
		2	A388	7	2
		1	[B733, B734, B735]	22	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	38	2
		1	[B741, B742, B743]	4	2
		1	B744	30	2
		1	[B762, B763]	7	2
	RON	1	[B733, B734, B735]	2	2
	TGW	1	[A319, A320, A321]	6	2
	UTY	1	F100	8	2
	VAU	1	B773	2	2
	VOZ	1	[B736, B737/BBJ, B738/BBJ, B739]	50	2
		1	B773	1	1
		1	[E170, E190]	19	2
	IGA	1	[A319, A320, A321]	1	1
	IGA	3	B350	1	1
	IGA	2	BE40	4	3
	IGA	2	C25A	1	1
	IGA	3	C510	1	1
	IGA	2	C525	5	5
	IGA	2	C550	9	8
	IGA	1	C560	2	2
	IGA	2	C650	5	5

Australia	IGA	3	C680	1	1
	IGA	2	C750	2	2
	IGA	1	CL60	5	5
	IGA	1	[E170, E190]	1	1
	IGA	1	F100	2	2
	IGA	2	F2TH	1	1
	IGA	2	[F900, F900EX]	2	2
	IGA	3	GL5T	1	1
	IGA	2	GLEX	2	2
	IGA	1	GLF4	3	3
	IGA	1	GLF5	1	1
	IGA	2	H25B	7	7
	IGA	2	H25C	1	1
	IGA	2	[LR35, LR36]	4	4
	IGA	2	LJ45	6	2
	IGA	1	LJ60	1	1
	IGA	2	PRM1	2	2
Total Australia				376	106

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Indonesia	AFE	1	MD80	2	2
		2	B732	1	1
		1	[E135, E145]	1	1
	AWQ	1	[B733, B734, B735]	8	2
		1	[A319, A320, A321]	2	2
	BTV	1	[B733, B734, B735]	15	2
		1	[A319, A320, A321]	4	2
	CGR	1	[B733, B734, B735]	2	2
	IGA	3	F28	2	2
	IGA	1	[E135, E145]	1	1
	GIA	1	[A332, A333]	6	2
		1	[B733, B734, B735]	41	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	4	2
		1	B744	3	2
	LNI	1	[B733, B734, B735]	12	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	12	2
		1	MD80	7	2
		1	MD90	5	2
	MDL	1	[A319, A320, A321]	8	2

Indonesia	MDL	1	[B733, B734, B735]	2	2
	MNA	1	[B733, B734, B735]	14	2
	PAS	3	F28	4	2
	SJY	2	B732	16	2
		1	[B733, B734, B735]	3	2
	TGN	2	C650	1	1
		2	B732	1	1
	TMG	2	B732	1	1
		1	[B721, B722]	1	1
	TRV	1	[B733, B734, B735]	1	1
		1	C560	1	1
		2	H25B	1	1
	TWA	3	F28	1	1
		2	PRM1	1	1
	XFA	2	B732	2	2
Total Indonesia				186	56

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Papua New Guinea	ANG	1	[B762, B763]	1	1
		1	B752	1	1
Total Papua New Guinea				2	2

AAMA Grand Total (Australia + Indonesia + Papua New Guinea)	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
	564	164

China RMA – Air Traffic Management Bureau (ATMB)
of Civil Aviation Administration of China (CAAC)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
China	CCA	1	[A332, A333]	20	2
		1	[A342, A343]	6	2
		1	B744 (10" Probe)	9	2
		1	B772	10	2
		1	B752	13	2
		1	[B733, B734, B735]	35	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	71	2
		1	[B762, B763]	7	2
		1	[A319, A320, A321]	48	2
		1	B744 (5" Probe)	3	2
	CDG	1	CRJ7	2	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	20	2
		1	[CRJ1, CRJ2]	5	2
		1	[B733, B734, B735]	12	2
	CES	1	A346	5	2
		1	[A30B, A306]	10	2
		1	[E135, E145]	10	2
		1	[CRJ1, CRJ2]	5	2
		1	[B762, B763]	3	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	41	2
		1	[B733, B734, B735]	23	2
		1	[A332, A333]	19	2
		1	[A319, A320, A321]	101	2
		1	MD90	9	2
		1	[A342, A343]	6	2
	CFI	2	C750	1	1
		1	C560	2	2
	CHB	1	[A319, A320, A321]	1	1
		1	[B733, B734, B735]	3	2
	CHH	1	A346	3	2
		1	[B733, B734, B735]	22	2
		1	[B762, B763]	3	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	48	2
		1	[A332, A333]	5	2

China	CKK	1	MD11	6	2
		1	B744 (?Probe)	2	2
	CQH	1	[A319, A320, A321]	12	2
	CQN	1	[A319, A320, A321]	7	2
	CSC	1	[A319, A320, A321]	38	2
		1	[E135, E145]	3	2
	CSH	1	B752	10	2
		2	H25B(800)	1	1
		1	[B736, B737/BBJ, B738/BBJ, B739]	32	2
		1	[B762, B763]	7	2
	CSN	1	B772	10	2
		1	[E135, E145]	6	2
		1	B752	17	2
		1	B744 (10" Probe)	2	2
		1	MD80 (All series)	7	2
		1	[A30B, A306]	6	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	72	2
		1	[B733, B734, B735]	23	2
		1	[A332, A333]	14	2
		1	[A319, A320, A321]	120	2
		1	MD90	13	2
		1	[A319, A320, A321]	27	2
	CSZ	1	[B736, B737/BBJ, B738/BBJ, B739]	43	2
		1	[B733, B734, B735]	9	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	6	2
	CUA	1	[B736, B737/BBJ, B738/BBJ, B739]	6	2
	CXA	1	B752	8	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	43	2
		1	[B733, B734, B735]	2	2
	CYZ	1	[B733, B734, B735]	13	2
	DBH	1	[A319, A320, A321]	1	1
		1	[E135, E145]	2	2
	DER	1	GLF4	3	2
		1	[A319, A320, A321]	20	2
		2	H25B(800)	7	4
		1	GLF5	1	1
		2	GALX	5	3
	DXH	1	[A319, A320, A321]	9	2
	EPA	1	[B733, B734, B735]	4	2

China	GCR	1	[E135, E145]	13	2
		1	[E170, E190]	13	2
	GDC	1	[B736, B737/BBJ, B738/BBJ, B739]	3	2
	GWL	1	B744 (10" Probe)	4	2
	HXA	1	[CRJ1, CRJ2]	3	2
	HZX	2	[F900, F900EX]	1	1
	JAE	1	B744 (?Probe)	6	2
	KNA	1	[B736, B737/BBJ, B738/BBJ, B739]	3	2
	KPA	1	[E170, E190]	3	2
	LKE	1	[B736, B737/BBJ, B738/BBJ, B739]	6	2
	OKA	1	[B733, B734, B735]	4	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	4	2
	SHQ	1	B752	2	2
		1	MD11	4	2
	UEA	1	[A319, A320, A321]	4	2
	UNA	1	A318	1	1
		2	F2TH	1	1
		2	GALX	2	2
	YZR	1	B744 (10" Probe)	3	2
		1	[B733, B734, B735]	6	2
	Total China				1278

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
DPRK	KOR	2	IL62	4	3
		2	IL76	1	1
		2	T134	1	1
		2	T154	1	1
		2	T204	1	1
Total DPRK				8	7

China RMA Grand Total (China + DPRK)	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
	1286	186

JCAB RMA - Japan Civil Aviation Bureau

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Japan	ADO	1	[B733,B734,B735]	5	2
		1	[B762,B763]	3	2
	AJV	1	[B762,B763]	6	2
	AJX	1	[B762,B763]	23	2
	ANA	1	[A319,A320,A321]	29	2
		1	B744 (5"Probe)	2	2
		1	B744 (10"Probe)	13	2
		1	[B762,B763]	61	2
		1	B772	23	2
		1	B773	20	2
	ANK	1	[A319,A320,A321]	24	2
		1	[B733,B734,B735]	20	2
		1	[B736,B737/BBJ,B738/BBJ,B739]	24	2
	GXY	1	[A30B,A306]	1	1
	IBX	1	[CRJ1,CRJ2]	4	2
	JAL	1	[A30B,A306]	22	2
		1	[B733,B734,B735]	19	2
		1	[B741,B742,B743]	7	2
		1	B744 (5"Probe)	13	2
		1	B744 (10"Probe)	31	2
		1	[B762,B763]	50	2
		1	B772	26	2
		1	B773	17	2
		1	MD80 (All series)	14	2
		1	MD90	16	2
	JAZ	1	[B741,B742,B743]	6	2
		1	B744 (5"Probe)	13	2
		1	B744 (10"Probe)	17	2
	JEX	1	[B733,B734,B735]	19	2
		1	[B736,B737/BBJ,B738/BBJ,B739]	19	2
		1	MD80 (All series)	13	2
	JTA	1	[B733,B734,B735]	23	2
	NCA	1	B744 (10"Probe)	8	2
	NXA	1	[B733,B734,B735]	20	2
	SFJ	1	[A319,A320,A321]	4	2

Japan	SKY	1	[B736,B737/BBJ,B738/BBJ,B739]	10	2
		1	[B762,B763]	1	1
	SNJ	1	[B733,B734,B735]	8	2
	IGA	1	C560	2	2
	IGA	1	C560	1	1
		2	C525	1	1
	IGA	2	C525	1	1
	IGA	1	GLF5	2	2
	IGA	2	C525	1	1
	IGA	2	C525	1	1
		3	C680	1	1
	IGA	2	C525	1	1
	IGA	1	C560	2	2
	IGA	2	C25A	1	1
	IGA	1	GLF4	2	2
		2	GLEX	2	2
	IGA	1	[CRJ1,CRJ2]	9	2
		1	[E170,E190]	3	2
	IGA	2	LJ31	1	1
	IGA	2	C25A	1	1
	IGA	3	B350	1	1
	IGA	2	C25A	1	1
	IGA	2	C25A	1	1
		3	C510	1	1
	IGA	1	C560	1	1
	IGA	2	C525	1	1
Total Japan				672	104

JCAB RMA Grand Total	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
	672	104

MAAR – Monitoring Agency for the Asia Region (AEROTHAI)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Bangladesh	BBC	1	A310	3	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	4	2
		1	[B741, B742, B743]	2	2
		1	DC10	4	2
	BEA	1	MD80	1	1
		2	B732	1	1
	GMG	1	MD80	3	2
Total Bangladesh				18	12

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Hong Kong, China	AHK	1	A300	8	2
	CPA	1	[A332, A333]	8	2
		1	[A342, A343]	15	2
		1	B741	3	2
		1	B744	42	2
		1	B772	5	2
		1	B773	21	2
		CRK	1	[B736, B737/BBJ, B738/BBJ, B739]	5
	HDA	1	A319	16	2
		1	[A332, A333]	14	2
		1	B744	1	1
		HKE	1	[B736, B737/BBJ, B738/BBJ, B739]	3
	MTJ	1	CL60	1	1
		2	GLF2	3	2
		2	GLF4	1	1
Total Hong Kong, China			146	27	

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
India	AIC	1	[A312, A313]	24	2
		1	[A319, A320, A321]	72	2
		1	[A332, A333]	2	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	2	2
		1	[B741, B742, B743]	6	2
		1	B744	13	2
		1	B772	4	2
		1	[B733, B734, B735]	9	2
	AXB	1	[B736, B737/BBJ, B738/BBJ, B739]	8	2
	BDA	1	[B736, B737/BBJ, B738/BBJ, B739]	4	2
		1	B752	4	2
	IGA	1	[A319, A320, A321]	1	1
		1	A333	1	1
		3	ASTR	1	1
		1	B734	1	1
		3	BD10	1	1
		2	BE40	3	3
		2	C25A	1	1
		2	C25B	1	1
		2	C525	3	3
		2	C550	5	5
		2	C560	3	3
		2	C56X	3	3
		2	C650	1	1
		3	C680	1	1
		1	CL60	5	5
		1	CRJ1	1	1
		1	E135	1	1
		2	F2TH	8	8
		2	F900	2	2
		3	G150	1	1
		3	GIVS	1	1
		2	GLEX	2	2
		2	GLF2	1	1
		1	GLF4	2	2
		1	GLF5	1	1
		3	H125	1	1

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
India		2	H25B	19	19
		2	LJ35	1	1
		2	LJ45	3	3
		1	LJ60	1	1
		2	PRM1	3	3
		3	R390	2	2
	GOW	1	[A319, A320, A321]	10	2
	IAC	1	[A319, A320, A321]	65	2
	IGO	1	[A319, A320, A321]	19	2
	JAI	1	A332	4	2
		1	[B733, B734, B735]	7	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	40	2
		1	B773	2	2
	KFR	1	[A319, A320, A321]	25	2
	LLR	1	CRJ7	3	2
	PMW	3	E170	5	5
	SEJ	1	[B736, B737/BBJ, B738/BBJ, B739]	18	2
Total India				427	128

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Macao, China	AMU	1	[A30B, A306]	2	2
		1	[A319, A320, A321]	5	2
	VVM	1	[B762, B763]	2	2
Total Macao, China				9	6

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
Malaysia	AXM	1	[A319, A320, A321]	28	2
		1	[B733, B734, B735]	25	2
	MAS	1	[A332, A333]	15	2
		1	[B733, B734, B735]	37	2
		1	[B741, B742, B743]	3	2
		1	B744	2	2
		1	B772	2	2
	TSE	1	[B721, B722]	1	1
Total Malaysia				113	15

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Myanmar	JAB	1	F100	2	2
Total Myanmar				2	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Nepal	RNA	1	B752	2	2
Total Nepal				2	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Pakistan	ABQ	1	[A319, A320, A321]	8	2
	PIA	1	[A312, A313]	13	2
		1	[B733, B734, B735]	7	2
		1	[B741, B742, B743]	11	2
		1	B772	6	2
		1	[B733, B734, B735]	2	2
	SAI	2	B732	3	2
Total Pakistan				50	14

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Philippines	CEB	1	[A319, A320, A321]	21	2
	GAP	1	[B733, B734, B735]	2	2
		2	B732	14	9
	PAL	1	[A319, A320, A321]	8	2
		1	[A332, A333]	8	2
		1	[A342, A343]	3	2
		1	[B733, B734, B735]	3	2
		1	B744	5	2
Total Philippines				64	23

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Singapore	JEC	1	[B741, B742, B743]	2	2
	JSA	1	[A319, A320, A321]	5	2
	SIA	1	A345	5	2
		1	B744	39	2
		1	B772	46	2
		1	[B733, B734, B735]	31	2
		3	A388	5	5
	SLK	1	[A319, A320, A321]	18	2
	SQC	1	B744	16	2
	TGW	1	[A319, A320, A321]	11	2
	VLU	1	[A319, A320, A321]	4	2
Total Singapore				182	25

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Sri Lanka	ALK	1	[A319, A320, A321]	3	2
		1	[A332, A333]	4	2
		1	[A342, A343]	5	2
Total Sri Lanka				12	6

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
Taiwan	CAL	1	[A30B, A306]	6	2
		1	[A332, A333]	16	2
		1	[A342, A343]	6	2
		1	[B736, B737/BBJ, B738/BBJ, B739]	13	2
		1	B744	38	2
	EVA	1	[A332, A333]	11	2
		1	B744	19	2
		1	[B733, B734, B735]	8	2
		1	MD11	12	2
		1	MD90	3	2
	MDA	1	[B736, B737/BBJ, B738/BBJ, B739]	2	2
		3	[E170, E190]	5	5
	TNA	1	[A319, A320, A321]	8	2
	UIA	1	MD90	10	2
Total Taiwan				157	31

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Thailand	AIQ	1	[A319, A320, A321]	8	2
		1	[B733, B734, B735]	12	2
	BKP	1	[A319, A320, A321]	10	2
		1	B712	4	2
	KMI	1	[B721, B722]	2	2
	NOK	1	[B733, B734, B735]	6	2
	OEA	1	[B741, B742, B743]	4	2
		1	MD80	7	2
	OTG	1	MD80	6	2
	PBA	1	[E135, E145]	2	2
	SKT	1	[B762, B763]	3	2
	THA	1	[A30B, A306]	21	2
		1	[A332, A333]	13	2
		1	A345	2	2
		1	A346	3	2
		1	[B733, B734, B735]	9	2
		1	B744	18	2
		1	B772	10	2
		1	[B733, B734, B735]	6	2
		1	MD11	4	2
Total Thailand				150	40

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Vietnam	HVN	1	[A319, A320, A321]	16	2
		1	[A332, A333]	3	3
		1	[B721, B722]	6	2
		2	F70	2	2
	PIC	1	[A319, A320, A321]	1	1
		1	[B733, B734, B735]	12	2
Total Vietnam				40	12

MAAR Grand Total <i>(Bangladesh + Hong Kong + India + Macao + Malaysia + Myanmar + Nepal + Pakistan + Philippines + Singapore + Sri Lanka + Taiwan + Thailand + Vietnam)</i>				Total # Airframes under Monitoring Group	Resultant Monitoring Burden
				1,372	343

PARMO- Pacific Approvals Registry and Monitoring Organization (USA FAA)

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Fiji	FJI	1	[B736, B737, B738, B739]	3	2
		1	B744	2	2
		1	[B762, B763]	1	1
Total Fiji				6	5

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
New Zealand	ANZ	1	[A319, A320, A321]	12	2
		1	[B733, B734, B735]	16	2
		1	B744	7	2
		1	[B762, B763]	5	2
		1	B772	8	2
	PBN	1	[B736, B737, B738, B739]	10	2
	IGA	1	GLF4	1	1
	IGA	3	WW24	1	1
	IGA	1	[B733, B734, B735]	1	1
Total New Zealand				61	15

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Vanuatu	AVN	1	[B733, B734, B735]	1	1
		1	[B736, B737, B738, B739]	1	1
Total Vanuatu				2	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Republic of Korea	AAR	1	[A319, A320, A321]	24	2
		1	[A332, A333]	7	2
		1	B744	12	2
		1	[B762, B763]	8	2
		1	B772	10	2
	KAL	1	[A30B, A306]	8	2
		1	[A332, A333]	19	2
		2	A388	1	1
		1	[B736, B737, B738, B739]	31	2
		1	B744	44	2
		1	B772	18	2
		1	B773	5	2
	IGA	2	GLEX	1	1
Total Republic of Korea				188	26

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Canada	ACA	1	[A332, A333]	8	2
		1	[B762, B763]	30	2
		1	B772	6	2
		1	B773	12	2
		3	[E170, E190]	60	2
	IGA	2	[LJ35, LJ36]	1	1
	IGA	1	CL60	3	3
	IGA	2	GLEX	1	1
	IGA	3	C680	1	1
	IGA	2	[FA50, FA50EX]	2	2
	IGA	2	[F900, F900EX]	1	1
	WJA	1	[B736, B737, B738, B739]	81	2
Total Canada (Asia/Pacific operations only)				206	21

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
Mexico	AMX	1	B772	4	2
	IGA	1	GLF4	1	1
	IGA	1	GLF5	1	1
	IGA	2	[F900, F900EX]	1	1
Total Mexico (Asia/Pacific operations only)				7	5

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	AAH	2	B732	1	1
	AAL	1	B752	124	2
		1	[B762, B763]	73	2
		1	B772	47	2
	ASA	1	[B736, B737, B738, B739]	82	2
	ATN	2	[DC86, DC87]	15	9
	AWE	1	[A319, A320, A321]	206	2
		1	[A332, A333]	11	2
		1	B752	36	2
	BJS	2	LJ45	1	1
	BSK	1	[B736, B737, B738, B739]	5	2
	CKS	1	[B741, B742, B743]	15	2
		1	B744	2	2
	COA	1	[B736, B737, B738, B739]	192	2
		1	B752	41	2
		1	B753	17	2
		1	[B762, B763]	10	2
		1	B764	16	2
		1	B772	20	2
	DAL	1	B752	147	2
		1	[B762, B763]	74	2
		1	B764	21	2
		1	B772	16	2
	EIA	1	[B741, B742, B743]	11	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	EJM	2	[F900, F900EX]	2	1
		2	GALX	2	2
		1	GLF4	7	2
	FDX	1	B752	20	2
		1	DC10	73	2
		1	MD11	58	2
	GTI	1	[B741, B742, B743]	11	2
		1	B744	8	2
	HAL	1	[B762, B763]	18	2
	KAI	1	GLF4	4	2
		1	GLF5	1	1
	LXJ	3	CL30	10	10
		1	CL60	10	2
	MGE	1	[B721, B722]	1	2
	NAC	2	B732	1	1
	NAO	1	[B762, B763]	6	2
	NWA	1	[A332, A333]	20	2
		1	[B741, B742, B743]	10	2
		1	B744	10	2
		1	B752	32	2
		1	B753	11	2
	OAE	1	B752	3	2
	OPT	2	BE40	8	5
	OPT	2	C750	3	2
	PAC	1	B744	7	2
	RYN	1	B752	1	1
	SGB	2	B732	4	3
	SKW	1	CRJ7	64	2
	SOO	1	[B741, B742, B743]	11	2
	SWA	1	[B736, B737, B738, B739]	341	2
	TAG	1	GLF4	5	2
	TCF	2	[E170, E190]	58	2
	UAL	1	[A319, A320, A321]	152	2
		1	B744	26	2
		1	B752	97	2
		1	[B762, B763]	35	2
		1	B772	52	2

Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	UPS	1	B744	10	2
		1	B752	75	2
		1	[B762, B763]	32	2
		1	MD11	37	2
	VNR	2	P180	1	1
	WOA	1	DC10	10	2
		1	MD11	14	2
	IGA	1	[A319, A320, A321]	1	1
	IGA	1	[B736, B737, B738, B739]	3	3
	IGA	1	[B762, B763]	4	4
	IGA	1	[E135, E145]	6	6
	IGA	2	[F900, F900EX]	21	21
	IGA	2	[FA50, FA50EX]	11	11
	IGA	2	[LJ35, LJ36]	17	17
	IGA	2	ASTR	8	8
	IGA	3	B350	2	2
	IGA	1	B74S	1	1
	IGA	2	BE40	1	1
	IGA	2	C25A	2	2
	IGA	2	C25B	3	3
	IGA	3	C441	1	1
	IGA	3	C501	3	3
	IGA	3	C510	2	2
	IGA	2	C525	7	7
	IGA	2	C550	10	10
	IGA	1	C560	10	10
	IGA	2	C56X	3	3
	IGA	3	C680	2	2
	IGA	2	C750	23	23
	IGA	3	CL30	4	4
	IGA	1	CL60	23	23
	IGA	3	EA50	1	1
	IGA	2	F2TH	9	9
	IGA	2	FA10	4	4
	IGA	2	FA20	1	1
	IGA	3	FA7X	2	2
	IGA	3	G150	1	1

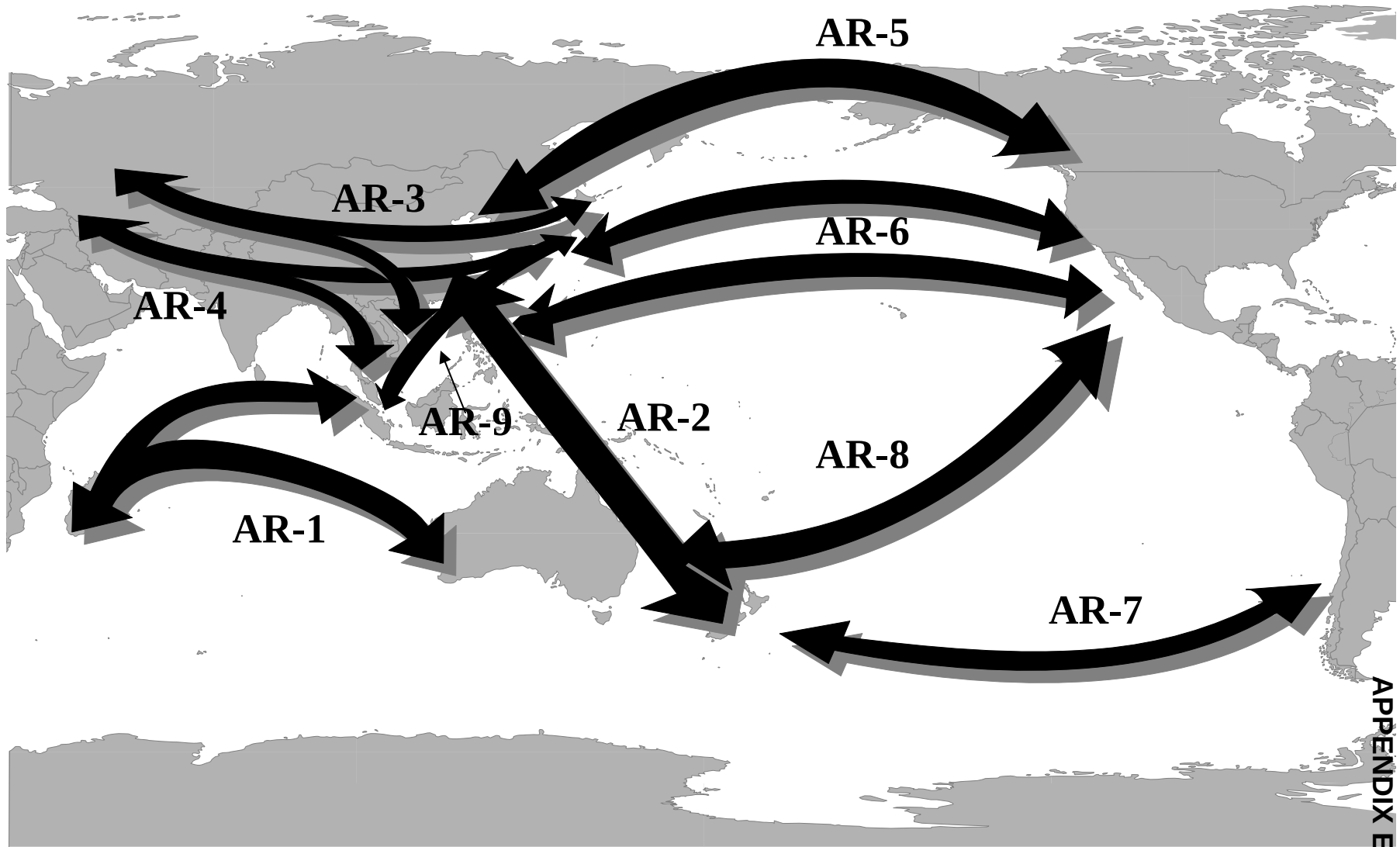
Responsible State	Operator	MMR Category (1,2 or 3)	Aircraft Monitoring Group (e.g. [A342,A343])	Total # Airframes under Monitoring Group	Resultant Monitoring Burden (# airframes)
United States	IGA	2	GALX	10	10
	IGA	2	GLEX	24	24
	IGA	2	GLF2	3	3
	IGA	2	GLF3	12	12
	IGA	1	GLF4	59	59
	IGA	1	GLF5	43	43
	IGA	2	H25B	7	7
	IGA	2	J328	1	1
	IGA	1	L101	1	1
	IGA	2	LJ31	3	3
	IGA	2	LJ45	1	1
	IGA	2	LJ55	1	1
	IGA	1	LJ60	3	3
	IGA	1	MD80	2	2
	IGA	2	PRM1	3	3
	IGA	2	SBR1	1	1
	IGA	3	TBM7	1	1
	IGA	3	WW24	5	5
Total United States <i>(Asia/Pacific operations only)</i>				2910	514

PARMO Grand Total <i>(Fiji + New Zealand + Vanuatu + Republic of Korea + Asia/Pacific operations conducted by North America operators (Canada + Mexico + United States))</i>	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
	3380	588

Overall Asia/Pacific – Estimated Total Monitoring Burden

Asia/Pacific Region - Grand Total <i>(AAMA + China RMA + JCAB RMA+ MAAR + PARMO)</i>	Total # Airframes under Monitoring Group	Resultant Monitoring Burden
	7274	1385

APAC MAJOR TRAFFIC FLOWS



**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE**



ASIA/PACIFIC REGION

EN-ROUTE MONITORING AGENCY (EMA)

HANDBOOK

Version 1 - September 2009

Issued by the ICAO Asia/Pacific Regional Office, Bangkok

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FOREWORD

The Regional Airspace Safety Monitoring Advisory Group (RASMAG) was established during 2004 by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to achieve a regional approach for coordination and harmonization of airspace safety monitoring activities, and to provide assistance to States in this respect.

The RASMAG noted that requirements for monitoring aircraft height-keeping performance and the safety of reduced vertical separation minimum (RVSM) operations had been more comprehensively developed than had requirements for monitoring other air traffic management (ATM) services, such as reduced horizontal separation based on performance based navigation (PBN), or for monitoring of air traffic services (ATS) data link systems. Although a handbook with detailed global guidance on the requirements for establishing and operating RVSM Regional Monitoring Agencies (RMA) had been developed by the ICAO Separation and Airspace Safety Panel (SASP), there was no comparable monitoring guidance document under development by ICAO for the safe use of a horizontal-plane separation minimum where PBN is applied and no suitable regional equivalent was available.

ICAO provisions require that the implementation of specified reduced separation minima, e.g. 50 NM lateral separation based on PBN RNAV 10, 50 NM longitudinal separation based on PBN RNAV 10 and Direct Pilot Controller Communication (DCPC), and PBN RNP 4 based 30 NM lateral and longitudinal separation based on Automatic Dependent Surveillance – Contract (ADS-C), Controller Pilot Data Link Communication (CPDLC), must first meet Annex 11 safety management system requirements and undergo a safety assessment based on collision risk modelling to confirm that the regionally established target level of safety (TLS) for the airspace has been met. Additionally, periodic safety reviews must be performed in order to permit continued operations. To date, the performance of safety assessments and continued monitoring for reduced horizontal separation minima had been carried out by a few specialized teams of technical experts and contractors supporting States within the region.

The recent inclusion of the previously independent RNP and RNAV concepts under ICAO's global PBN concept has led to some uncertainty amongst States regarding the monitoring requirements for reduced horizontal separation minima implementations where these minima are based on PBN approvals. The RASMAG agreed that there was a need to develop a handbook aimed at standardizing the principles and practices of the work of En-route Monitoring Agencies (EMAs) established to assess the safety performance of implementations utilizing reduced horizontal plane separations, in order to ensure the continued safe application of reduced horizontal separation standards in international airspace.

In anticipation of more widespread use of the PBN RNAV 10 and RNP 4 navigation specifications within the international airspace of the Asia/Pacific Region, this handbook is being provided to identify the safety assessment and monitoring requirements and related EMA duties and responsibilities associated with those navigation specifications, as well as the reduced separation minima which may be implemented based upon compliance with them. It should be noted that, with the exception of 50 NM lateral separation, introduction of the reduced horizontal minima additionally necessitates satisfaction of explicit communications and surveillance requirements as well as the navigation performance requirements.

The EMA Handbook is presented in two parts. Part 1 defines an EMA, describes its functions by means of a list of duties and responsibilities, and identifies the process by which an organization gains credentials as an EMA. Part 2 provides specific guidance to assist an EMA in carrying out the duties and responsibilities called for by Part 1.

APANPIRG has adopted this EMA Handbook under the terms of Conclusion 20/25 as an Asia/Pacific regional guidance material. It is intended that the handbook will introduce a common set of principles and practices for safety assessment and ongoing safety monitoring in connection with operational usage of reduced horizontal-plane separation minima based on the application of PBN. The handbook will also help to promote an interchange of information among Asia/Pacific States in support of achieving common operational monitoring procedures, as well as supporting the acquisition and sharing of data resulting from the application of those procedures.

LIST OF ABBREVIATIONS AND ACRONYMS

ADS-C	Automatic Dependent Surveillance - Contract
ANSP	Air Navigation Service Provider
APANPIRG	Asia Pacific Air Navigation Planning and Implementation Regional Group
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
CPDLC	Controller Pilot Data Link Communication
CRM	Collision Risk Model
EMA	En-route Monitoring Agency
FIR	Flight Information Region
FTP	File Transfer Protocol
ICAO	International Civil Aviation Organization
LLD	Large Lateral Deviation
LLE	Large Longitudinal Error
MASPS	Minimum Aviation System Performance Standard
NM	Nautical Miles
PBN	Performance-Based Navigation
RASMAG	Regional Airspace Safety Monitoring Advisory Group of APANPIRG
RMA	Regional Monitoring Agency
RNAV	Area navigation
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum
SASP	Separation and Airspace Safety Panel
SSR	Secondary Surveillance Radar
STC	Supplemental Type Certificate
TLS	Target Level of Safety

EXPLANATION OF TERMS

Collision risk.

The expected number of mid-air collisions in a prescribed volume of airspace for a specific number of flight hours due to loss of planned separation. (*Note: One collision is considered to produce two accidents.*)

Core (lateral) navigational performance.

That portion of overall navigational performance which accounts for the bulk of observed lateral errors and which can be characterized by a single statistical distribution, usually symmetric about the mean lateral error with the frequency of increasing-magnitude errors decaying at least exponentially.

Exclusionary PBN airspace.

Airspace in which flight cannot be planned by civil aircraft which do not hold a valid PBN approval from the appropriate State authority.

Horizontal separation.

The spacing provided between aircraft in the horizontal (lateral or longitudinal) plane to avoid collision.

Large lateral deviation (LLD).

Any deviation of 15 NM or more to the left or right of the current flight-plan track.

Large longitudinal error (LLE).

Any unexpected change in longitudinal separation between an aircraft pair, or for an individual aircraft the difference between an estimate for a given fix and the actual time of arrival over that fix, as applicable, in accordance with the criteria set out below:

Type of Error	Category of Error	Criterion for Reporting
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Infringement of longitudinal separation standard based on routine position reports
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Expected time between two aircraft varies by 3 minutes or more based on routine position reports
Longitudinal deviation	Individual-aircraft (Time-based separation applied)	Pilot estimate varies by 3 minutes or more from that advised in a routine position report
Longitudinal deviation	Aircraft-pair (Distance-based separation applied)	Infringement of longitudinal separation standard, based on ADS-C, radar measurement or special request for RNAV position report

Type of Error	Category of Error	Criterion for Reporting
Longitudinal deviation	Aircraft-pair (Distance-based separation applied)	Expected distance between an aircraft pair varies by 10NM or more, even if separation standard is not infringed, based on ADS-C, radar measurement or special request for RNAV position report

Occupancy.

A parameter of the collision risk model which is twice the count of aircraft proximate pairs in a single dimension divided by the total number of aircraft flying the candidate paths in the same time interval.

Operational Approval.

An approval granted to an operator by the State authority after being satisfied that the operator meets specific aircraft and operational requirements.

Operational risk.

The risk of collision due to operational errors and in-flight contingencies.

Overall risk.

The risk of collision due to all causes, which includes the technical risk and the operational risk.

Passing frequency.

The frequency of events in which the centers of mass of two aircraft are at least as close together as the metallic length of a typical aircraft when traveling in the opposite or same direction on adjacent routes separated by the planned lateral separation at the same flight level.

Target level of safety (TLS).

A generic term representing the level of risk which is considered acceptable in particular circumstances.

Technical Risk

The risk of collision associated with aircraft navigation performance.

PART 1

Description, Functions and Establishment of an En-route Monitoring Agency

1.1 Description

1.1.1 An En-route Monitoring Agency (EMA) is an organization providing airspace safety assessment and monitoring services to support the introduction and continued safe use of en-route horizontal-plane separation minima. An EMA comprises a group of specialists who carry out specific functions to provide these services. These functions are summarized in the following outline of EMA duties and responsibilities.

1.2 EMA Duties and Responsibilities

1.2.1 The duties and responsibilities of an EMA are:

- a) to establish and maintain a database of operational approvals specific to the horizontal-plane separation applied in the EMA's area of responsibility;
- b) to coordinate monitoring of horizontal-plane navigational performance and the identification of large horizontal-plane deviations;
- c) to receive reports of large horizontal-plane deviations identified during monitoring; to take the necessary action with the relevant State authority and operator to determine the likely cause of the horizontal-plane deviation and to verify the approval status of the relevant operator;
- d) to analyze data to detect horizontal-plane deviation trends and, hence, to take action as in the previous item;
- e) to undertake data collections as required by RASMAG to:
 - 1) investigate the navigational performance of the aircraft in the core of the distribution of lateral deviations;
 - 2) establish or add to a database on the lateral navigational performance of:
 - o the aircraft population
 - o aircraft types or categories
 - o individual airframes;
 - 3) examine the forecast accuracy of aircraft-provided times at future (i.e next position) required reporting points
- f) to archive results of navigational performance monitoring and to conduct periodic risk assessments in light of agreed regional safety goals;
- g) to contribute to a regional database of monitoring results;
- h) to initiate necessary remedial actions and coordinate with specialist groups as necessary in the light of monitoring results;

- i) to monitor the level of risk as a consequence of operational errors and in-flight contingencies as follows:
 - 1) determine, wherever possible, the root cause of each horizontal plane deviation together with its size and duration;
 - 2) calculate the frequency of occurrence;
 - 3) assess the overall risk in the system against the overall safety objectives; and
 - 4) initiate remedial action as required;
- j) to initiate checks of the approval status of aircraft operating in the relevant airspace where horizontal-plane separation is applied, identify non-approved operators and aircraft using the airspace and notify the appropriate State of Registry/State of the Operator accordingly; and
- k) to submit reports as required to APANPIRG through RASMAG.

1.3 Process for Establishing an EMA

1.3.1 An organization proposing to offer EMA services must be approved by the Regional Airspace Monitoring Safety Advisory Group of APANPIRG (RASMAG).

1.3.2 In order to effectively carry out the duties and responsibilities of an EMA, an organization must be able to demonstrate an acceptable level of competence. Competence may be demonstrated by:

- a) previous monitoring experience; or
- b) participation in ICAO technical panels or other bodies which develop horizontal separation requirements or criteria for establishing separation minima based on PBN; or
- c) establishment of a formal relationship with an organization qualified under (a) or (b).

1.3.3 Once competence has been demonstrated, including presentation of sufficient material to RASMAG on which to make a reasoned assessment, the EMA should receive a formal approval by RASMAG as recorded in the relevant RASMAG meeting report and in the *RASMAG List of Competent Airspace Safety Monitoring Organizations*.

1.3.4 **Appendix A** lists the RASMAG regionally approved EMAs and the Asia/Pacific FIRs for which they hold EMA responsibility.

PART 2

Responsibilities and Standardized Practices of En-route Monitoring Agencies

2.1 Purpose of this part

2.1.1 The purpose of this Part of the EMA Handbook is to document experience gained by organizations supporting the introduction of reduced horizontal-plane separation minima within the Asia/Pacific Region, and elsewhere, in order to assist an EMA in fulfilling its responsibilities. Where necessary to ensure standardized practices among EMAs, detailed guidance is elaborated further in appendices.

2.2 Establishment and Maintenance of database of PBN and other Approvals

2.2.1 The experience gained through the introduction of RVSM within Asia/Pacific has shown that the concept of utilising monitoring agencies is essential to ensure safety in the region. Monitoring agencies have a significant role to play in all aspects of the safety monitoring process. One of the functions of an EMA is to establish a database of operators and aircraft or aircraft types approved by State authorities for PBN operations and, if necessary, for use of data link (ADS-C/CPDLC) in the region for which the EMA has responsibility. This information is of vital importance in effectively assessing the risk in the airspace.

2.2.2 Aviation is a global industry; many operators may be approved for PBN and data link operations and their approvals registered with an EMA operating in a region where reduced horizontal separation has been implemented. Thus, there is considerable opportunity for information sharing among EMAs. While a region or sub-region introducing reduced horizontal-plane separation may need its own EMA to act as a focal point for the collection and collation of approvals for aircraft operating solely in that region, it may not need to maintain a complete database of all approved aircraft globally. It will, however, be required to establish links with other EMAs in order to determine the PBN and/or data link status of aircraft.

2.2.3 To avoid duplication by States in registering approvals with EMAs, the concept of a designated EMA for the processing of approval data has been established. Under the designated EMA concept, all States are associated with a specified EMA for the reporting of PBN and data link approvals. **Appendix B** provides a listing of States and the respective designated EMA for PBN and data link approvals. EMAs may contact any State to address safety matters without regard to the designated EMA for approvals.

2.2.4 It is important to note that, in general, the aircraft operating in airspace where implementation of PBN-based separation is planned can be grouped into two categories. Some aircraft operate solely within the airspace targeted for introduction of reduced separation standards (and therefore may not have PBN and other required approval status) and others operate both within that airspace and other portions of airspace requiring PBN and other approvals.

2.2.5 It is the responsibility of the EMA supporting implementation of reduced separation to gather State approvals data for the former category of aircraft from authorities responsible for issuing those approvals. To do so requires the EMA to establish a communication link with each such State authority and to provide a precise description of the approvals information required. **Appendix C** provides typical forms, with a brief description of their use, that an EMA might transmit to a State authority to obtain information on aircraft PBN or data link approval status.

2.2.6 To avoid duplication of work effort, wherever possible the EMA should collect State approvals information for the latter category of aircraft – those already operating in other airspace where reduced horizontal-plane separation minima are applied – from other EMAs. This collection will be facilitated if each EMA maintains, in a similar electronic form, a database of State PBN and data link approvals.

2.2.7 **Appendix D** describes the minimum database content required and the format in which it should be maintained by an EMA. Appendix D also contains a description of the data to be shared by EMAs and proposes procedures for data sharing.

2.3 Monitoring of Horizontal Plane Navigation Performance

2.3.1 An EMA must be prepared to collect the information necessary to monitor horizontal-plane navigational performance as part of the risk assessment. It must institute procedures to monitor core navigational performance and to continuously collect information descriptive of large deviations and operational errors in the horizontal plane.

Monitoring Core Navigational Performance

2.3.2 The EMA will investigate the navigational performance of the aircraft in the core of the distribution of lateral deviations by comparing aircraft reported position information with non-aircraft generated position information such as radar data. The EMA analysis of core navigation performance contributes to the determination of lateral overlap probability used in conducting a safety assessment. An EMA must enlist the cooperation of States and air navigation service providers (ANSPs) in monitoring horizontal-plane core navigational performance through the use of secondary surveillance radar or other appropriate surveillance systems. States and ANSPs have the responsibility to cooperate with the EMA and supply any requested data that will contribute to the evaluation of core navigational performance.

Monitoring of Large Lateral Deviations and Large Longitudinal Errors

2.3.3 Experience has shown that LLDs and LLEs have had significant influence on the outcome of safety assessments before and after implementation of PBN-based separation in a portion of airspace. Accordingly, a principal duty of an EMA is to ensure the existence of a programme to collect this information, assess the occurrences and initiate remedial action to correct systemic problems. Section 2.6 provides guidance to an EMA for initiating such remedial actions as may be necessary to resolve systemic problems uncovered by this programme. One way to ensure the existence of such a programme is to develop letters of agreement between States.

2.3.4 A programme to assess the occurrence of LLDs and LLEs will usually include a regional Scrutiny Group to support the EMA monitoring function. A Scrutiny Group is comprised of operational and technical subject matter experts that support the evaluation and classification of LLDs and LLEs.

2.3.5 Within the airspace for which it is responsible, each ANSP will need to establish the means to detect and report the occurrence of large horizontal-plane deviations. Experience has shown that the primary sources for reports of large horizontal-plane deviations are the ATC units providing air traffic control services in the airspace where reduced separation is or will be applied. The surveillance information available to these units – in the form of voice or ADS-C reports and, where available, surveillance radar or ADS-B returns – provides the basis for identifying large horizontal-plane deviations.

2.3.6 A programme for identifying large horizontal-plane deviations should be established and ATC units should report such events monthly. An example format for these monthly reports is shown in **Appendix E**. These reports should contain, as a minimum, the following information:

- a) Reporting unit;
- b) Location of deviation, either as latitude/longitude, ATS route waypoint or other ATC fix;
- c) Date and time of large horizontal-plane deviation;
- d) Sub-portion of airspace, such as established route system, if applicable;
- e) Flight identification and aircraft type;
- f) Actual flight level or altitude;
- g) Horizontal separation being applied;
- h) Size of deviation;
- i) Duration of large deviation;
- j) Cause of deviation;
- k) Any other traffic in potential conflict during deviation;
- l) Crew comments when notified of deviation; and
- m) Remarks from ATC unit making report.

2.3.7 Other sources for reports of large horizontal-plane deviations should also be explored. An EMA is encouraged to determine if operators within the airspace for which it is responsible are willing to share pertinent summary information from internal safety oversight databases. In addition, an EMA should enquire about access to State databases of safety incident reports which may be pertinent to the airspace. An EMA should also examine voluntary reporting safety databases, where these are available, as possible sources of large horizontal-plane deviations incidents in the airspace for which it is responsible.

2.3.8 While an EMA will be the recipient and archivist for reports of large horizontal-plane deviations, it is important to note that an EMA alone cannot be expected to conduct all activities associated with a comprehensive programme to detect and report large horizontal-plane deviations. Rather, an EMA should enlist the support of RASMAG, the ICAO Regional Office, appropriate implementation task forces, scrutiny groups or any other entity that can assist in the establishment of such a programme.

2.4 Conducting Safety Assessments and Reporting Results

Safety Assessment

2.4.1 In order to conduct a safety assessment, an EMA will need to acquire an in-depth knowledge of the use of the airspace, typical aircraft types etc within which the reduced horizontal-plane separation will be implemented. Experience has shown that such knowledge can be gained through acquisition of charts and other material describing the airspace, and through periodic collection and analysis of samples of traffic movements within the airspace. The collation and consideration of this information results in a “Know Your Airspace” (KYA) analysis that documents matters of relevance to the reduced horizontal separation implementation being proposed. An example of a typical KYA analysis is included as **Appendix F**.

2.4.2 A safety assessment conducted by an EMA consists of estimating the risk of collision associated with the horizontal-plane separation standard and comparing this risk to the established TLS. Examples of internationally recognised Collision Risk Models (CRMs) used in the development and implementation of reduced separation minima and their application in an example safety assessment (for the South China Sea area) are included in **Appendix G** of this document and in the ICAO Doc 9689 *Manual of Airspace Planning Methodology for the Determination of Separation Minima*.

2.4.3 RASMAG will determine the safety reporting requirements (e.g. format and periodicity) for the EMA.

Establishing the Competence Necessary to Conduct a Safety Assessment

2.4.4 Conducting a safety assessment is a complex task requiring specialized skills which are not practiced widely. As a result, prior to receiving RASMAG approval to operate as an EMA, the organization will need to demonstrate to RASMAG the necessary competence to complete the required tasks.

2.4.5 Ideally, an EMA will have the internal competence to conduct a safety assessment. However, recognizing that personnel with the required skills may not be available internally, an EMA may find it necessary to augment its staff, either through arrangements with another EMA or with an external (i.e. non EMA) organization possessing the necessary competence.

2.4.6 If it is necessary to use an external organization to conduct a safety assessment, an EMA must have the competence to judge that such an assessment is done properly. This competence could be acquired through an arrangement with an EMA which has conducted safety assessments.

2.4.7 An EMA will need to take into account that a safety assessment must reflect the factors which influence collision risk within the airspace where the reduced horizontal-plane separation will be applied. Thus, an EMA will need to establish a method to collect and organize pertinent data and other information descriptive of these airspace factors. As will be noted below, some data sources from other airspace where reduced horizontal-plane separation has been implemented may assist an EMA in conducting a safety assessment. However, an EMA may not use the safety assessment results from another portion of airspace as the sole justification for concluding that the TLS will be met in the airspace where the EMA has safety assessment responsibility.

Assembling a sample of traffic movements from the airspace

2.4.8 Samples of traffic movement data should be collected for the entire airspace where reduced horizontal-plane separation will be implemented. As a result, ANSPs providing services within the airspace are required to cooperate in providing this data.

2.4.9 In planning the timing and duration of a traffic movement data sample, an EMA should take into account the importance of capturing any periods of heavy traffic flow which might result from seasonal or other factors. The duration of any traffic sample should be at least 30 days, with a longer sample period left to the judgment of an EMA. By regional agreement, as recorded in APANPIRG Conclusion 16/4, traffic sample data within the Asia/Pacific Region is collected by all States for the month of December each year for purposes of RVSM monitoring. During 2009, APANPIRG 20 expanded the usage of this data under certain conditions to support regional implementations, including reduced horizontal plane separation minima.

2.4.10 The following information should be collected for each flight in the sample:

- a) date of flight;
- b) flight identification or aircraft call sign, in standard ICAO format;
- c) aircraft registration mark, if available;
- d) PBN approval type;
- e) aircraft type conducting the flight, as listed in the applicable edition of ICAO Doc 8643, Aircraft Type Designators;
- f) origin aerodrome, as listed in the applicable edition of ICAO Doc 7910, Location Indicators;
- g) destination aerodrome, as listed in the applicable edition of ICAO Doc 7910, Location Indicators;
- h) entry point (fix or latitude/longitude) into the airspace;
- i) time (UTC) at entry point;

- j) flight level (and assigned Mach number if available) at entry point;
- k) route after entry point;
- l) exit point from the airspace;
- m) time (UTC) at exit point;
- n) flight level (and assigned Mach number if available) at exit point;
- o) route before exit fix; and
- p) additional fix/time/flight-level/route combinations that the EMA judges are necessary to capture the traffic movement characteristics of the airspace.

2.4.11 Where possible, in coordinating collection of the sample, an EMA should specify that information be provided in electronic form (for example, in a spreadsheet). **Appendix H** contains a sample specification for collection of traffic movement data in electronic form, where the entries in the first column may be used as column headings on a spreadsheet template.

2.4.12 Acceptable sources for the information required in a traffic movement sample could include one or more of the following: ATC observations, ATC automation system data, automated air traffic management system data and secondary surveillance radar (SSR) reports.

Data Link Performance Monitoring

2.4.13 Applications specific to communication systems required for PBN-based operations such as data link introduce operational and technical risk into the system. Therefore end-to-end safety performance monitoring of air-ground and ground-air data link communication services should be ongoing, in accordance with the information contained in the *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region*, issued by the ICAO Asia and Pacific Office, Bangkok. In the assessment of risk levels, an EMA may find it necessary to use data link performance data from data link Central Reporting Agencies (CRAs).

2.4.14 In conducting data link monitoring, CRA's could evaluate the following communication and surveillance performance elements:

- a) Position reporting methods and usage;
- b) Flight plans and data link capabilities;
- c) ADS-C downlink message traffic;
- d) ADS-C downlink transit times;
- e) ADS-C uplink message traffic;
- f) ADS-C uplink transit and response times;
- g) Anomalies identified in ADS-C data;
- h) Uplink messages with no response;
- i) CPDLC uplink and downlink message traffic, including response times; and
- j) Communication service provider outages and the effect on data link performance

Determining whether the Safety Assessment satisfies the TLS

2.4.15 "Technical risk" is the term used to describe the risk of collision associated with aircraft navigation performance. Some of the factors which contribute to technical risk are:

- a) errors in aircraft navigation systems; and
- b) aircraft equipment failures resulting in unmitigated deviation from the cleared flight path, including those where not following the required procedures further increases the risk.

2.4.16 “Operational risk” is the term used to describe the risk of collision due to operational errors and in-flight contingencies. The term “operational error” is used to describe any horizontal deviation of an aircraft from the correct flight path as a result of incorrect action by ATC or the flight crew. Examples of such actions include:

- a) a flight crew misunderstanding an ATC clearance, resulting in the aircraft operating on a flight path other than that issued in the clearance;
- b) ATC issuing a clearance which places an aircraft on a flight path where the required separation from other aircraft cannot be maintained;
- c) a coordination failure between ATC units in the transfer of control responsibility for an aircraft, resulting in either no notification of the transfer or in transfer at an unexpected transfer point;
- d) weather deviation (Note: these deviations may be instances where the aircraft captain initiates the manoeuvre using operational authority but without advising ATC, and are not necessarily deemed as being incorrect action. However, they still contribute to operational risk and should be reported).

2.4.17 The TLS which must be satisfied is established by regional agreement and documented in the *Regional Supplementary Procedures* (Doc 7030). The generic Asia/Pacific TLS is presently established, for each dimension (lateral, longitudinal and vertical), as 5×10^{-9} fatal accidents per flight hour due to loss of planned separation; however, specific TLS values may be determined by ICAO for application of a particular separation minimum.

2.5 Monitoring Operator Compliance with State Approval Requirements

2.5.1 The overall intent of post-implementation EMA activities is to support continued safe use of the reduced horizontal-plane separation. One important post-implementation activity is monitoring operator compliance with State approval requirements by carrying out periodic checks of the approval status of operators and aircraft using airspace where PBN-based separation is applied. This is vital if reduced separation is applied on an exclusionary basis, that is, if State PBN and data link approval is a prerequisite for use of the airspace.

2.5.2 An EMA will require two sources of information to monitor operator compliance with State approval requirements: a listing of the operators, and the type and registration marks of aircraft conducting operations in the airspace; and the database of State PBN and data link approvals.

2.5.3 Ideally, this compliance monitoring should be done for the entire airspace on a daily basis. Clearly, difficulties in accessing traffic movement information may make such daily monitoring impossible. However, as a minimum an EMA should conduct compliance monitoring of the complete airspace for at least a 30-day period annually. A flow chart depicting the process required for monitoring operator compliance with State approvals has been included as **Appendix I**.

2.5.4 When conducting compliance monitoring, the filed PBN or data link approval status shown on the flight plan of each aircraft movement should be compared to the database of State PBN and data link approvals. When a flight plan shows a PBN or data link approval not confirmed in the database, the appropriate State authority should be contacted for clarification of the discrepancy. An EMA should use a letter similar in form to that shown in **Appendix J** as the official notification.

2.5.5 An EMA should keep in mind that the responsibility to take any action should an operator be found to have filed an incorrect declaration of State PBN or data link approval lies clearly with the State authority, not the EMA. The EMA responsibility is only to make the appropriate State authority aware of the issue, and provide advice or information as requested by the State authority.

2.6 Remedial Actions

2.6.1 Remedial actions are those measures taken to remove causes of systemic problems associated with factors affecting safe use of the PBN-based separation. Remedial actions may be necessary to remove the causes of problems such as the following:

- a) failure of an aircraft to comply with PBN or data link requirements,
- b) aircraft operating practices resulting in large horizontal-plane deviations, and
- c) operational errors.

2.6.2 Monitoring results should be periodically reviewed by the EMA and the associated regional Scrutiny Group in order to determine if there is evidence of any recurring problems or adverse trends. Guidance on the functions of a Scrutiny Group is contained in **Appendix K**.

2.6.3 As a minimum, an EMA and the associated Scrutiny Group should conduct an annual review of reports of large horizontal-plane deviations with a view toward uncovering systemic problems and initiating remedial action. Should such problems be identified, an EMA should report its findings to the body overseeing horizontal-plane separation implementation, or to the RASMAG. An EMA should include in its report the details of large horizontal-plane deviations suggesting the root cause of the problem.

2.7 Review of Operational Concept

2.7.1 Experience has shown that the operational concept for the application of the horizontal-plane separation adopted by bodies overseeing horizontal-plane separation implementations can substantially affect the collision risk in airspace.

2.7.2 An EMA should review carefully the operational concept agreed by the body overseeing horizontal-plane separation implementation, generally the ANSP, with a view to identifying any features of airspace use which may influence risk. The flow chart at **Appendix L** provides an overview of the implementation process for reduced horizontal plane separation minima and draws attention to the interrelationships between the implementation activities of the ANSP and the safety assessment and monitoring responsibilities of the EMA. An EMA should inform the oversight body of any aspects of the operational concept which it considers important in this respect.

APPENDIX A

Flight Information Regions and Responsible En-route Monitoring Agency

FIR	Responsible EMA
Anchorage Oceanic	PARMO
Auckland Oceanic	
Bangkok	
Beijing	
Brisbane	AAMA
Calcutta	
Chennai	
Colombo	
Delhi	
Dhaka	
Fukuoka	
Guangzhou	
Hanoi	
Ho Chi Minh	SEASMA
Hong Kong	SEASMA
Honiara	
Inchon	
Jakarta	
Kabul	
Karachi	
Kathmandu	
Kota Kinabalu	SEASMA
Kuala Lumpur	SEASMA
Kunming	
Lahore	
Lanzhou	
Male	
Manila	SEASMA
Melbourne	AAMA
Mumbai	
Nadi	
Nauru	
Oakland Oceanic	PARMO
Phnom Penh	
Pyongyang	
Port Moresby	
Sanya	SEASMA
Shanghai	
Shenyang	
Singapore	SEASMA
Tahiti	
Taipei	
Ujung Pandang	
Ulaan Baatar	
Urumqi	
Vientiane	
Wuhan	
Yangon	

APPENDIX B

States and Designated EMA for the reporting of En-route PBN and Data Link Approvals

The following table provides a listing of States and the respective designated EMA for the reporting of en-route PBN and data link approvals. Each EMA should advise the relevant States of its requirements with respect to reporting of en-route PBN and data link approvals.

ICAO Contracting State	Designated EMA for PBN and Data Link Approvals
Afghanistan	
Australia	AAMA
Bangladesh	
Bhutan	
Brunei Darussalam	
Cambodia	
China (for Sanya FIR)	SEASMA
China (except Sanya FIR)	
Cook Islands	
Democratic People's Republic of Korea	
Fiji	
India	
Indonesia	
Japan	
Kiribati	
Lao People's Democratic Republic	
Malaysia	SEASMA
Maldives	
Marshall Islands	
Micronesia (Federated States of)	
Mongolia	
Myanmar	
Nauru	
Nepal	
New Zealand	
Pakistan	
Palau	
Papua New Guinea	
Philippines	SEASMA
Republic of Korea	
Samoa	
Singapore	SEASMA
Solomon Islands	
Sri Lanka	
Thailand	
Tonga	
United States	PARMO
Vanuatu	
Viet Nam	SEASMA

APPENDIX C

EMA Forms For Use in Obtaining Records of En-route PBN and Data Link Approvals from a State Authority

There are 3 EMA forms for the collection of essential information relating to en-route PBN and data link approvals:

EMA A1 – Point of Contact Details for Matters Relating to PBN or Data Link Approvals

EMA A2 – Record of en-route PBN or Data Link Approval

EMA A3 – Withdrawal of en-route PBN or Data Link Approval

1. Please read these notes before attempting to complete forms EMA A1, A2 and A3.
2. It is important for the EMAs to have an accurate record of a point of contact for any queries that might arise from the monitoring of horizontal-plane separation. Recipients are therefore requested to include a completed EMA A1 with their first reply to the EMA. Thereafter, there is no further requirement unless there has been a change to the information requested on the form.
3. Form EMA A2 must be completed for each operator/aircraft granted a PBN or data link approval.
4. Form EMA A3 must be completed and submitted immediately whenever a State of Registry has cause to withdraw an operator/aircraft en-route PBN or data link approval.
5. Note: the fields in the forms EMA A2 and EMA A3 should be completed as indicated below.

Fields	Instruction
State of Registry State of Operator State of PBN Approval	Enter the 2-letter ICAO identifier as contained in ICAO Doc 7910. In the case of there being more than one identifier designated for the State, use the letter identifier that appears first.
Operator Identifier	Enter the operator's 3 letter ICAO identifier as contained in ICAO Doc 8585. For International General Aviation, enter "IGA". If none, place an X in this field and enter the name of the operator/owner in the Remarks row.
Operator Type	Enter or Select Operator Type. E.g. Civil or Military
Registration Date Date of Approval Date of Expiry	Enter date in dd/mm/yyyy format, e.g. for 26 October 2007 enter 26/10/2007.
Aircraft Type	Enter the ICAO designator as contained in ICAO Doc 8643, e.g., for Airbus A320-211, enter A320; for Boeing B747-438 enter B744.
Aircraft Series	Enter series of aircraft type or manufacturer's customer designation, e.g., for Airbus A320-211, enter 211; for Boeing B747-438, enter 400 or 438.
Mode S Address Code (Hex)	Enter ICAO allocated Aircraft Mode S address code in hexadecimal format.
PBN Approval Type	Enter or select the type of PBN Approval, e.g. RNP 2, RNP 4, RNAV 10 or Others. Enter new line for each approval type.
Remarks	Any Remarks

EMA A1

POINT OF CONTACT DETAILS
FOR MATTERS RELATING TO EN-ROUTE PBN OR DATA LINK APPROVALS

*This form should be completed and returned to the address below on the first reply to the EMA and when there is a change to any of the details requested on the form. **PLEASE USE BLOCK CAPITALS THROUGHOUT.***

NAME OF STATE AUTHORITY OR ORGANISATION			
STATE OF REGISTRY			
STATE OF REGISTRY (ICAO 2 letter identifier)			

If there is more than one identifier for the State, please use the first that appears in the list.

ADDRESS DETAILS	
STREET	
CITY	
STATE/PROVINCE	
ZIP/POSTAL CODE	
COUNTRY/REGION	

CONTACT PERSON	
TITLE	
FIRST NAME	
MIDDLE NAME	
LAST NAME	
JOB TITLE	
EMAIL	

PHONE DETAILS			
COUNTRY CODE		AREA CODE	
DIRECT LINE		FAX NUMBER	

Please Tick One: ☐ Initial Reply ☐ Change of details

When complete, please return to:

EMA Address

Telephone:

Fax:

E-Mail

EMA A2

RECORD OF EN-ROUTE PBN APPROVAL

When a State of Registry approves or amends the approval of an operator/aircraft for en-route PBN operations, details of that approval must be recorded and sent to the appropriate EMA without delay.

Please refer to the accompanying notes on the following page before providing the information requested below. PLEASE USE BLOCK CAPITALS.

State of Registry:	<table border="1"><tr><td></td><td></td></tr></table>												
State of Operator:	<table border="1"><tr><td></td><td></td></tr></table>												
Operator Identifier:	<table border="1"><tr><td></td><td></td><td></td></tr></table>												
Name of Operator:	<table border="1"><tr><td colspan="10"></td></tr></table>												
Operator Type:	<table border="1"><tr><td colspan="10">* CIVIL / * MILITARY (* DELETE AS APPROPRIATE)</td></tr></table>	* CIVIL / * MILITARY (* DELETE AS APPROPRIATE)											
* CIVIL / * MILITARY (* DELETE AS APPROPRIATE)													
Registration Date:	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Aircraft Type:	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr></table>												
Aircraft Series:	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Manufacturers Serial Number:	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Registration Mark:	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Mode S Address Code (Hex):	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Number of Navigation System:	<table border="1"><tr><td></td></tr></table>												
Make/Model of Long Range Navigation System:	<table border="1"><tr><td colspan="10"></td></tr></table>												
PBN Approval Type:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
PBN Time Limit:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Date of Approval:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Date of Expiry:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Approval Authority (CAA):	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Approving CAA Official:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Region for PBN Approval:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
State of PBN Approval:	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Status of Previous PBN Approval:	☐ None ☐ Withdrawn												
If withdrawn, please provide previous Registration Mark	<table border="1"><tr><td></td></tr></table>												
:													
Remarks	<table border="1"><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr></table>												

When complete, please return to the following address.

EMA Address

Telephone:

Fax:

Email:

Fields	Instruction
State of Registry State of Operator State of PBN Approval	Enter the 2-letter ICAO identifier as contained in ICAO Doc 7910. In the case of there being more than one identifier designated for the State, use the letter identifier that appears first.
Operator Identifier	Enter the operator's 3 letter ICAO identifier as contained in ICAO Doc 8585. For International General Aviation, enter "IGA". If none, place an X in this field and enter the name of the operator/owner in the Remarks row.
Operator Type	Enter or Select Operator Type. E.g. Civil or Military
Registration Date Date of Approval Date of Expiry	Enter date in dd/mm/yyyy format, e.g. for 26 October 2007 enter 26/10/2007.
Aircraft Type	Enter the ICAO designator as contained in ICAO Doc 8643, e.g., for Airbus A320-211, enter A320; for Boeing B747-438 enter B744.
Aircraft Series	Enter series of aircraft type or manufacturer's customer designation, e.g., for Airbus A320-211, enter 211; for Boeing B747-438, enter 400 or 438.
Mode S Address Code (Hex)	Enter ICAO allocated Aircraft Mode S address code in hexadecimal format.
PBN Approval Type	Enter or select the type of PBN Approval, e.g. RNP 2, RNP 4, RNAV 10 or Others. Enter new line for each approval type.
Remarks	Any Remarks

EMA A3

WITHDRAWAL OF EN-ROUTE PBN OR DATALINK APPROVAL

When a State of Registry has cause to withdraw the en-route PBN or data link approval of an operator/aircraft, the details requested below must be sent to the EMA without delay.

Please refer to the accompanying notes on the following page before providing the information requested. PLEASE USE BLOCK CAPITALS.

State of Registry	<table border="1"><tr><td></td><td></td></tr></table>												
Operator Identifier	<table border="1"><tr><td></td><td></td><td></td></tr></table>												
State of Operator	<table border="1"><tr><td></td><td></td></tr></table>												
Aircraft Type	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Aircraft Series	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Manufacturers Serial Number	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Registration Mark	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Mode S Address Code (Hex)	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												
Approval Withdrawn (PBN or DL)	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Date of Withdrawal	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
PBN Withdrawn CAA Official	<table border="1"><tr><td></td><td></td><td></td><td></td></tr></table>												
Reason for Withdrawal	<table border="1"><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr><tr><td></td></tr></table>												

When complete, please return to the following address.

EMA Address

Telephone:

Fax:

Email:

Fields	Instruction
State of Registry State of Operator	Enter the 2-letter ICAO identifier as contained in ICAO Doc 7910. In the case of there being more than one identifier designated for the State, use the letter identifier that appears first.
Operator Identifier	Enter the operator's 3 letter ICAO identifier as contained in ICAO Doc 8585. For International General Aviation, enter "IGA". If none, place an X in this field and enter the name of the operator/owner in the Remarks row.
Date of Withdrawal	Enter date in dd/mm/yyyy format, e.g. for 26 October 2007 enter 26/10/2007.
Aircraft Type	Enter the ICAO designator as contained in ICAO Doc 8643, e.g., for Airbus A320-211, enter A320; for Boeing B747-438 enter B744.
Aircraft Series	Enter series of aircraft type or manufacturer's customer designation, e.g., for Airbus A320-211, enter 211; for Boeing B747-438, enter 400 or 438.
Mode S Address Code (Hex)	Enter ICAO allocated Aircraft Mode S address code in hexadecimal format.
Approval Withdrawn	Enter or select the type of PBN Approval, e.g. RNP 2, RNP 4, RNAV 10 or Others. Enter new line for each approval type.

APPENDIX D

Minimal Informational Content for Each State En-route PBN or Data Link Approval to Be Maintained In Electronic Form by an EMA

Aircraft PBN and Data Link Approvals Data

To properly maintain and track PBN and data link approval information some basic aircraft identification information is required (e.g., manufacturer, type, serial number, etc.) as well as details specific to an aircraft's PBN and data link approval status. Table 1 below lists the minimum data fields to be collected by an EMA for an individual aircraft. Table 2 on the following page describes the approvals database record format.

Table 1: Aircraft PBN and Data Link Approvals Data

Field	Description
Registration Mark	Aircraft's current registration mark
Mode S Address Code (Hex)	Aircraft's current Mode S code 6 hexadecimal digits
Manufacturer Serial Number	Aircraft Serial Number as given by manufacturer
Aircraft Type	Aircraft Type as defined by ICAO document 8643
Aircraft Series	Aircraft generic series as described by the aircraft manufacturer (e.g., 747-100, series = 100)
State of Registry	State to which the aircraft is currently registered as defined in ICAO document 7910
Registration Date	Date registration was active for current operator
Operator Identifier	ICAO code for the current Operator as defined in ICAO document 8585
Operator Name	Name of the current Operator
State of Operator	State of the current Operator as defined in ICAO document 7910
Operator Type	Aircraft is civil or military
PBN approval type	PBN approval – e.g. RNP 4, RNAV 2, RNP 1
Region for PBN approval	Name of region where the PBN approval is applicable Note: Only required if PBN Approval is issued for a specific region
State of PBN approval	State granting PBN approval as defined in ICAO document 9613
Date PBN approved	Date of PBN Approval
Date of PBN expiry	Date of Expiry for PBN Approval
Date of Data Link approval	Date of Data Link Approval
Remarks	Open comments
Date of withdrawal of PBN approval	Date of withdrawal of the aircraft's PBN approval (if applicable)
Info by Authority	Yes or no indication "Was the information provided to the EMA by a State Authority?"

Table 2: Approvals Database Record Format

Field	Description	Type	Width	Valid Range
State of Registry	State of Registry	Alphabetic	2	AA-ZZ
Operator	Operator	Alphabetic	3	AAA-ZZZ
State of Operator	State of Operator	Alphabetic	2	AA-ZZ
AC Type	Aircraft Type	Alphanumeric	4	e.g. MD11
AC Mark/Series	Aircraft Mark / Series	Alphanumeric	6	
Serial Number	Manufacturer's Serial/Construction Number	Alphanumeric	12	
AC Registration Mark	Aircraft registration mark	Alphanumeric	10	
Mode S	Aircraft Mode "S" address (Hexadecimal)	Alphanumeric	6	000001-FFFFFF
PBN approval type	PBN approval type	Alphanumeric	6	e.g. RNP4
Approval Date	Date PBN approval issued (dd/mm/yyyy)	Date	10	e.g. 31/12/1999
Date of expiry	Date of expiry of PBN approval (if any) (dd/mm/yyyy)	Date	10	e.g. 31/12/1999
DL Approval Date	Date Data Link approval issued (dd/mm/yyyy)	Date	10	e.g. 31/12/1999
Remarks	National remarks	Alphanumeric	60	ASCII text

Aircraft Re-Registration/Operating Status Change Data

Aircraft frequently change registration information. Re-registration and change of operating status information is required to properly maintain an accurate list of the current population. Table 3 below lists the minimum data fields to be maintained by an EMA to manage aircraft re-registration/operating status change data.

Table 3: Aircraft Re-Registration/Operating Status Change Data

Field	Description
Reason for change	Reason for change. Aircraft was re-registered, destroyed, parked, etc.
Previous Registration Mark	Aircraft's previous registration mark.
Previous Mode S	Aircraft's previous Mode S code.
Previous Operator Name	Previous name of operator of the aircraft.
Previous Operator ICAO Code	ICAO code for previous aircraft operator.
Previous State of Operator	ICAO code for the previous State of the operator
New State of Operator	ICAO code for the State of the current aircraft operator.
New Registration Mark	Aircraft's current registration mark.
New State of Registration	Aircraft's current State of Registry.
New Operator Name	Current name of operator of the aircraft.
New Operator ICAO Code	ICAO code for the current aircraft operator.
Aircraft ICAO Type designator	Aircraft Type as defined by ICAO document 8643
Aircraft Series	Aircraft generic series as described by the aircraft manufacturer (e.g., 747-100, series = 100).
Serial Number	Aircraft Serial Number as given by manufacturer
New Mode S	Aircraft's current Mode S code 6 hexadecimal digits.
Date change is effective	Date new registration/ change of status became effective.

Point of Contact Data

An accurate and up to date list of contact officers essential for an EMA to conduct its business. Table 4 lists the minimum content for organizational contacts and Table 5 lists the minimum content for individual points-of-contact.

Table 4: *Organizational Contact Data*

Field	Description
Type	Type of contact (e.g., Operator, Airworthiness Authority, Manufacturer)
State	State in which the company is located.
State ICAO	ICAO code for the State in which the company is located.
Company/Authority	Name of the company/authority as used by ICAO (e.g., Bombardier)
Fax No	Fax number for the company.
Telephone number	Telephone number for the company.
Address (1-4)	Address lines 1-4 filled as appropriate for the company.
Place	Place (city, etc.) in which the company is located.
Postal code	Postal code for the company.
Country	Country in which the company is located.
Remarks	Open comments
Modification date	Last Modification Date.
Web-site	Company Web HTTP Location.
e-mail	Company e-mail address.
Civ/mil	Civil or Military.

Table 5: *Individual Point of Contact Data*

Field	Description
Title contact	Mr., Mrs., Ms., etc.
Surname contact	Surname or family name of point of contact.
Name contact	Given name of point of contact.
Position contact	Work title of the point of contact.
Company/Authority	Name of the company/authority as used by ICAO (e.g., Bombardier)
Department	Department for the point of contact.
Address (1-4)	Address lines 1-4 filled as appropriate for the point of contact.
Place	Place (city, etc.) in which the point of contact is located.
Postal code	Postal code for the location of the point of contact.
State	State in which the point of contact is located.
Country	Country in which the point of contact is located.
E-mail	E-mail of the point of contact.
Telex	Telex number of the point of contact.
Fax No	Fax number of the point of contact.
Telephone no 1	First telephone number for the point of contact.
Telephone no 2	Second telephone number for the point of contact.

Data Exchange between EMAs

The following sections describe how data is to be shared between EMAs as well as the minimum data set that should be passed from one EMA to another. This minimum sharing data set is a sub-set of the data defined in previous sections of Appendix D.

All EMAs receiving data have responsibility to help ensure data integrity. A receiving EMA must report back to the sending EMA any discrepancies or incorrect information found in the sent data.

Data Exchange Procedures

The standard mode of exchange shall be e-mail or FTP, with frequency of submission in accordance with Table 6 below. Data shall be presented in Microsoft Excel or Microsoft Access.

EMAs must be aware that the data are current only to the date of the created file.

Table 6: *EMA Data Exchange Procedures*

Data Type	Data Subset	Frequency	When
PBN and Data Link approvals	All	Monthly	First week in month
Aircraft Re-registration/ status	New since last broadcast	Monthly	First week in month
Contact	All	Monthly	First week in month
Non-Compliant Aircraft	All	As Required.	Immediate

In addition to regular data exchanges, one-off queries shall be made between EMAs as necessary. This includes requests for data in addition to the minimum exchanged data set such as service bulletin information.

Exchange of Aircraft Approvals Data

An EMA shall exchange PBN and Data Link Approvals data with other EMAs. Table 7 below defines the fields required for sending a record to another EMA.

Table 7: *Exchange of Aircraft Approvals Data*

Field	Need to Share
Registration Mark	Mandatory
Mode S	Desirable
Serial Number	Desirable
Aircraft Type	Mandatory
Aircraft Series	Mandatory
State of Registry	Mandatory
Registration date	Desirable
Operator Identifier	Mandatory
Operator Name	Desirable
State of Operator	Mandatory
Civil or military indication (not a field on its own. It is indicated in the ICAO operator code as MIL except when the military has a code)	Desirable
PBN approval type	Mandatory
State of PBN approval	Mandatory
Date PBN approved	Mandatory
Date of PBN approval expiry	Mandatory
Date Data Link approved	Mandatory
Remarks	No
Date of withdrawal of PBN approval	Mandatory
Information by Authority	Mandatory

Aircraft Re-Registration/Operating Status Change Data

An EMA shall share all re-registration information.

Table 8: *Exchange of Aircraft Re-Registration/Operating Status Change Data*

Field	Need to Share
Reason for change (i.e. re-registered, destroyed, parked)	Mandatory
Previous Registration Mark	Mandatory
Previous Mode S	Desirable
Previous Operator Name	Desirable
Previous Operator ICAO Code	Mandatory
Previous State of Operator	Mandatory
State of Operator	Mandatory
New Registration Mark	Mandatory
New State of Registration	Mandatory
New Operator Name	Desirable
New Operator Code	Desirable
Aircraft ICAO Type designator	Mandatory
Aircraft Series	Mandatory
Serial Number	Mandatory
New Mode S	Mandatory
Date change is effective	Desirable

Exchange of Contact Data

An EMA shall share all organization and individual point of contact data in accordance with Tables 9 and 10 below.

Table 9: *Exchange of Organizational Contact Data Fields*

Field	Need to Share
Type	Mandatory
State	Mandatory
State ICAO	Desirable
Company/Authority	Mandatory
Fax No	Desirable
Telephone number	Mandatory
Address (1-4)	Mandatory
Place	Mandatory
Postal code	Mandatory
Country	Mandatory
e-mail	Desirable
civil/military	Desirable

Table 10: *Exchange of Individual Point of Contact Data Fields*

Field	Need to Share
Title contact	Desirable
Surname contact	Mandatory
Name contact	Desirable
Position contact	Desirable
Company/Authority	Mandatory
Department	Desirable
Address (1-4)	Mandatory
Place	Mandatory
Postal code	Mandatory
Country	Mandatory
State	Mandatory
E-mail	Desirable
Fax No	Desirable
Telephone no 1	Mandatory
Telephone no 2	Desirable

Confirmed Non-Compliant Information

As part of its monitoring assessments an EMA may identify a non-compliant aircraft. This information should be made available to other EMAs. When identifying a non-compliant aircraft an EMA should include:

- Notifying EMA
- Date sent
- Registration Mark
- Mode S
- Serial Number
- ICAO Type Designator
- State of Registry
- Registration Date
- Operator ICAO Code
- Operator Name
- State of Operator
- Date(s) of non-compliance(s)
- Action started (y/n)
- Date non-compliance resolved

Fixed parameters -Reference Data Sources

The sources of some standard data formats used by an EMA are listed below.

- ICAO Doc. 7910 “Location Indicators”
- ICAO Document 8585 “Designators for Aircraft Operating Agencies, Aeronautical Authorities, and Services”
- ICAO Document 8643 “Aircraft Type Designators”
- IATA “Airline Coding Directory”

APPENDIX E

Suggested Form for ATC Unit Monthly Report of LLD or LLE

[EN-ROUTE MONITORING AGENCY NAME]

Report of Large Lateral Deviation or Large Longitudinal Error

Report to the (*En-route Monitoring Agency Name*) of a large lateral deviation (LLD) or a large longitudinal error (LLE), including those due to weather deviations and other contingency events, as defined below:

Type of Error	Category of Error	Criterion for Reporting
Lateral deviation	Individual-aircraft error	15NM or greater magnitude
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Infringement of longitudinal separation standard based on routine position reports
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Expected time between two aircraft varies by 3 minutes or more based on routine position reports
Longitudinal deviation	Individual-aircraft (Time-based separation applied)	Pilot estimate varies by 3 minutes or more from that advised in a routine position report
Longitudinal deviation	Aircraft-pair (Distance-based separation applied)	Infringement of longitudinal separation standard, based on ADS-C, radar measurement or special request for RNAV position report
Longitudinal deviation	Aircraft-pair (Distance-based separation applied)	Expected distance between an aircraft pair varies by 10NM or more, even if separation standard is not infringed, based on ADS-C, radar measurement or special request for RNAV position report

Name of ATC unit: _____

Please complete Section I or II as appropriate

SECTION I:

There were no reports of LLDs or LLEs for the month of _____

SECTION II:

There was/were _____ report(s) of LLD

There was/were _____ report(s) of LLE

Details of the LLDs and LLEs are attached.

(Please use a separate form for each report of lateral deviation or longitudinal error).

SECTION III:

When complete please forward the report(s) to:

En-route Monitoring Agency Name

Postal address

Telephone:

Fax:

E-Mail:

NAVIGATION ERROR INVESTIGATION FORM

PART 1 - To be completed by responsible officer in the Service Provider (and aircraft owner/operator if necessary)		
ATC Unit Observing Error:		
Date/Time (UTC):		
Duration of Deviation:		
Type of Error: (tick one) ☐ LATERAL ☐ LONGITUDINAL		
Details of Aircraft		
	First Aircraft	Second Aircraft (when longitudinal deviation observed)
Aircraft Identification:		
Name of owner/Operator:		
Aircraft Type:		
Departure Point:		
Destination:		
Route Segment:		
Cleared Track:		
Position where error was observed: (BRG/DIST from fixed point or LAT/LONG)		
Extent of deviation – magnitude and direction: (NM for lateral, min/NM for longitudinal)		
Flight Level:		
Approximated Duration of Deviation (minutes)		
For All Errors		
Action taken by ATC:		
Crew Comments when notified of Deviation:		
Other Comments:		

**** (Please Attach ATS Flight Plan)**

NAVIGATION ERROR INVESTIGATION FORM

PART 2 - Details of Aircraft, and Navigation and Communications Equipment Fit (To be completed by aircraft owner/operator)			
LRNS	Number of Systems (0, 1, 2 etc.)	Make	Model
INS IRS GNSS FMS Others (please Specify)			
COMS			
HF VHF SATCOM CPDLC			
Which navigation system was coupled to the autopilot at the time of observation of the error?			
Which Navigation Mode was selected at the time of observation of the error?			
Which Communication System was in use at the time of observation of the error?			
Aircraft registration and model/series			
Was the aircraft operating according to PBN requirements?		☐ Yes ☐ No	

NAVIGATION ERROR INVESTIGATION FORM

PART 3 – Detailed description of incident (To be completed by owner/operator – use separate sheet if required)
Please give your assessment of the actual track flown by the aircraft, and the cause of the deviation:
Corrective action proposed:

PART 4 – To be completed by owner/operator, only in the event of partial or total navigation equipment failure.			
Navigation System Type	INS	IRS/FMS	Others (Please specify)
Indicate the number of units of each type which failed			
Indicate position at which failure(s) occurred			
Give an estimate of the duration of the equipment failure(s)			
At what time were ATC advised of the failure(s)?			

NAVIGATION ERROR INVESTIGATION FORM

PART 5 – To be completed by investigating agency		
Have all required data been supplied?	☐ Yes	☐ No
Is further investigation warranted?	☐ Yes	☐ No
Will this incident be the subject of a separate report?	☐ Yes	☐ No
Description of Error:		
Classification: (please circle) A B C D E F G H I		
CLASSIFICATION OF NAVIGATION ERRORS		
Deviation Code	Cause of Deviation	
Operational Errors		
A	Flight crew deviate without ATC Clearance;	
B	Flight crew incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.);	
C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position;	
D	ATC system loop error (e.g. ATC issues incorrect clearance, Flight crew misunderstands clearance message etc);	
E	Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility;	
Deviation due to navigational errors		
F	Navigation errors, including equipment failure of which notification was not received by ATC or notified too late for action;	
Deviation due to Meteorological Conditions		
G	Turbulence or other weather related causes (other than approved);	
Others		
H	An aircraft without PBN approval;	
I	Others (Please specify)	

APPENDIX F

Example “Know Your Airspace” Analysis

Examination of Operations conducted on South China Sea - RNAV routes L642 and M771

1. INTRODUCTION

1.1 This appendix shows how the characteristics of ATS routes L642 and M771 airspace analysis, derived from the traffic movement data collected during December 2007 and other sources, could support the safety assessment on the implementation of the reduced horizontal separation minima. This is an example of a “Know Your Airspace” (KYA) analysis.

2. BACKGROUND

2.1 As the result of APANPIRG agreement, traffic movement information is collected each December from all Asia/Pacific Region flight information regions (FIRs) within which the Reduced Vertical Separation Minimum (RVSM) is applied. The traffic movement sample is termed the Traffic Sample Data (TSD). The TSD contains the following information for each flight operating in RVSM airspace during the month:

- a) call sign;
- b) aircraft type;
- c) origin aerodrome;
- d) destination aerodrome;
- e) on entry into the RVSM airspace of the FIR, the entry fix, entry time, entry flight level and route followed after the entry fix;
- f) on exit from RVSM airspace, the exit fix, corresponding time and flight level, and route followed after the exit fix; and
- g) optionally, for fixes internal to RVSM airspace, the fix name, corresponding time and flight level and routing after the fix

2.2 These data contribute to the conduct of an annual assessment of the safety of continued RVSM use. With proper treatment, these data are also useful to support assessment of the safety of reduced lateral and longitudinal separation minima.

2.3 Four FIRs – Ho Chi Minh, Hong Kong, Sanya and Singapore – have air traffic control responsibility for L642 and M771. Records of all flights operating on L642 and M771 from each of the four TSDs were merged through a software process to avoid duplicate counting of flights. The resulting combined TSD was compared to the TSD from each FIR in order to check for flights missing from individual TSDs but reported in others, and for agreement of times at fixes common to two TSDs. These and other consistency checks led to the conclusion that the quality of data-entry in each of the TSD samples was very high, and that, as a consequence, the combined December 2007 TSD provided a highly reliable basis for gaining insight into the airspace characteristics of flight operations on L642 and M771.

2.4 After processing and merging, a total of 5743 flight operations were observed on L642 and M771 during December 2007.

3. CHARACTERISTICS OF L642 AND M771

3.1 Flights operating on L642 and M771 in the combined December 2007 TSD were examined to identify and quantify several important characteristics of airspace use. Principal among these are the profile of operators using the routes, the aircraft types observed on the routes, the origin-destination aerodrome pairs for operations, flight level use on the routes and the operator/aircraft-type pairs seen to have used L642 or M771.

Operator Profile

3.2 Each traffic movement was examined to determine the operator conducting the flight. A total of 61 unique three-letter ICAO operator designators were observed in the merged TSD. Table 1 presents the top 25 of these operator-designator counts, which account for nearly 97 percent of the operations. As will be noted, the top four operators account for nearly half of the operations, while the top 10 account for about three operations in four.

Number	Operator	Count	Proportion	Cumulative Count	Cumulative Proportion
1	SIA	1045	0.1820	1045	0.1820
2	CPA	839	0.1461	1884	0.3281
3	AXM	439	0.0764	2323	0.4045
4	MAS	393	0.0684	2716	0.4729
5	CES	334	0.0582	3050	0.5311
6	CSN	328	0.0571	3378	0.5882
7	TGW	327	0.0569	3705	0.6451
8	CCA	248	0.0432	3953	0.6883
9	CXA	191	0.0333	4144	0.7216
10	GIA	159	0.0277	4303	0.7493
11	SLK	157	0.0273	4460	0.7766
12	CAL	142	0.0247	4602	0.8013
13	SQC	139	0.0242	4741	0.8255
14	HVN	139	0.0242	4880	0.8497
15	JSA	125	0.0218	5005	0.8715
16	UAL	99	0.0172	5104	0.8887
17	CSZ	97	0.0169	5201	0.9056
18	HKE	62	0.0108	5263	0.9164
19	SHQ	58	0.0101	5321	0.9265
20	AHK	46	0.0080	5367	0.9345
21	TSE	42	0.0073	5409	0.9418
22	CRK	41	0.0071	5450	0.9490
23	VVM	39	0.0068	5489	0.9558
24	KAL	31	0.0054	5520	0.9612
25	CSH	31	0.0054	5551	0.9666

Table 1. Top 25 Operator Designators Observed in Combined December 2007 TSD

3.3 A total of 37 unique ICAO four-letter aircraft-designators were found in the combined December 2007 TSD. Inspection of the data showed that less than one-half of one percent of December 2007 operations on L642 and M771 were conducted by either international general aviation (IGA) or State aircraft. The top 15 aircraft types, accounting for 97 percent of the December 2007 operations, are shown in table 2.

Number	Type	Count	Proportion	Cumulative Count	Cumulative Proportion
1	A320	1083	0.1886	1083	0.1886
2	B772	900	0.1567	1983	0.3453
3	A333	791	0.1377	2774	0.4830
4	B773	557	0.0970	3331	0.5800
5	B738	554	0.0965	3885	0.6765
6	B744	465	0.0810	4350	0.7574
7	A319	314	0.0547	4664	0.8121
8	A306	148	0.0258	4812	0.8379
9	B737	147	0.0256	4959	0.8635
10	A321	145	0.0252	5104	0.8887
11	B752	125	0.0218	5229	0.9105
12	B742	108	0.0188	5337	0.9293
13	MD11	90	0.0157	5427	0.9450
14	B763	82	0.0143	5509	0.9593
15	A343	62	0.0108	5571	0.9701

Table 2. Top 15 Aircraft-Type Designators Observed in Combined December 2007 TSD

3.4 Application of 50 NM longitudinal separation requires availability of Direct Controller-Pilot Communication (DCPC). In previous applications of 50 NM longitudinal separation within the Asia/Pacific Region, this requirement has been satisfied through direct high frequency radio communication between pilots and controllers, as well as through availability of controller-pilot data link communications (CPDLC) and the contract mode of automatic dependent surveillance (ADS-C).

3.5 As can be seen from the table above, the most frequently occurring aircraft type, the A320, accounts for nearly 19 percent of the operations. The DCPC requirement for operations of this aircraft type will likely need to be satisfied by other than CPDLC or ADS-C. The A320 are not known to be among those aircraft types equipped with either CPDLC or ADS-C. Likewise, types 5, 7, 8, 9, 10, 11, 12 and 14 (B738, A319, A306, B737, A321, B757, B742 and B763, respectively) – which account for an additional 19 percent of the operations in the December 2007 sample – are not known to be equipped, typically, with these technologies.

Origin-Destination Aerodromes

3.5 A total of 46 aerodromes appeared as either origins or destinations of flights in the combined December 2007 TSD. These aerodromes gave rise to a total of 106 origin-destination pairings.

3.6 The top 20 origin-destination pairs, in terms of operations, are shown in table 3. As can be seen from the table, nearly one in five operations flew between Singapore Changi Airport and Hong Kong International Airport.

Number	Origin/ Destination	Count	Proportion	Cumulative Count	Cumulative Proportion
1	WSSS VHHH	549	0.0956	549	0.0956
2	VHHH WSSS	509	0.0886	1058	0.1842
3	ZSPD WSSS	297	0.0517	1355	0.2359
4	WSSS ZSPD	271	0.0472	1626	0.2831
5	VHHH WMKK	221	0.0385	1847	0.3216
6	WMKK VHHH	207	0.0360	2054	0.3577
7	VVTS WSSS	177	0.0308	2231	0.3885
8	ZBAA WSSS	174	0.0303	2405	0.4188
9	WSSS ZBAA	174	0.0303	2579	0.4491
10	ZSPD WMKK	159	0.0277	2738	0.4768
11	WSSS ZSAM	156	0.0272	2894	0.5039
12	VHHH VVTS	143	0.0249	3037	0.5288
13	WMKK ZSPD	142	0.0247	3179	0.5535
14	WSSS ZGGG	133	0.0232	3312	0.5767
15	VMMC WMKK	130	0.0226	3442	0.5993
16	ZGGG WSSS	128	0.0223	3570	0.6216
17	WMKK VMMC	127	0.0221	3697	0.6437
18	VHHH WIII	124	0.0216	3821	0.6653
19	WIII VHHH	119	0.0207	3940	0.6861
20	ZSAM WSSS	115	0.0200	4055	0.7061

Table 3. Top 20 Origin-Destination Pairs Observed in Combined December 2007 TSD

Use of the RNAV Routes

3.7 Table 4 shows use of the two routes in the combined December 2007 TSD. As can be seen, the proportion of operations on the two routes is not balanced.

Number	Route	Count	Proportion	Cumulative Count	Cumulative Proportion
1	L642	3067	0.5340	3067	0.5340
2	M771	2676	0.4660	5743	1.0000

Table 4. Count of Operations on L642 and M771

Flight-Level Usage on L642 and M771

3.8 Table 5 below presents the flight levels (FLs) and associated frequencies observed in the traffic sample. As can be seen, in order of use, FLs 360, 380 and 340 are the preferred altitudes on the routes, and account for 77 percent of the operations. The one observation at FL220 is very likely due to a minor error in data transcription or interpretation.

Number	FL	Count	Proportion	Cumulative Count	Cumulative Proportion
1	360	1738	0.3026	1738	0.3026
2	380	1442	0.2511	3180	0.5537
3	340	1244	0.2166	4424	0.7703
4	400	565	0.0984	4989	0.8687
5	320	459	0.0799	5448	0.9486
6	390	93	0.0162	5541	0.9648
7	300	90	0.0157	5631	0.9805
8	310	36	0.0063	5667	0.9868
9	410	29	0.0050	5696	0.9918
10	330	24	0.0042	5720	0.9960
11	370	9	0.0016	5729	0.9976
12	350	7	0.0012	5736	0.9988
13	290	6	0.0010	5742	0.9998
14	220	1	0.0002	5743	1.0000

Table 5. Flight-Level Use on L642 and M771

Operator/Aircraft-Type Combinations

3.9 In all, 107 combinations of operator and aircraft type were observed in the combined December 2007 TSD. The top 21 such combinations, accounting for 70 percent of the operations, are shown in Table 6, with both the operator and aircraft type designations shown in standard ICAO notation. The knowledgeable reader can determine readily those combinations likely to be equipped with CPDLC and ADS-C.

Pair Number	Operator-Aircraft Type	Count	Proportion	Cumulative Count	Cumulative Proportion
1	SIA-B772	611	0.1064	611	0.1064
2	AXM-A320	439	0.0764	1050	0.1828
3	CPA-A333	336	0.0585	1386	0.2413
4	TGW-A320	327	0.0569	1713	0.2983
5	SIA-B773	312	0.0543	2025	0.3526
6	CPA-B773	245	0.0427	2270	0.3953
7	MAS-A333	193	0.0336	2463	0.4289
8	CXA-B737	144	0.0251	2607	0.4539
9	SQC-B744	139	0.0242	2746	0.4781
10	JSA-A320	125	0.0218	2871	0.4999
11	CES-A333	124	0.0216	2995	0.5215
12	CES-A319	122	0.0212	3117	0.5427
13	SIA-B744	122	0.0212	3239	0.5640
14	CSN-A320	103	0.0179	3342	0.5819
15	MAS-B772	103	0.0179	3445	0.5999
16	UAL-B744	99	0.0172	3544	0.6171
17	CSN-A319	99	0.0172	3643	0.6343
18	CSZ-B738	97	0.0169	3740	0.6512
19	CPA-B772	95	0.0165	3835	0.6678
20	SLK-A319	93	0.0162	3928	0.6840
21	GIA-B738	92	0.0160	4020	0.7000

Table 6. Top 21 Operator/Aircraft-Type Combinations Observed in Combined December 2007 TSD

4. SUMMARY

4.1 The above reviews the Top 25 operators, Top 15 aircraft types, Top 20 origin-destination pairs, flight level use and Top 21 operator/aircraft-type combinations observed in the TSDs in light of the planned introduction of 50 NM lateral and longitudinal separation standards on L642 and M771. Using published information about data link use in other portions of Asia/Pacific Region airspace, this analysis notes the possible aircraft types and operators which might qualify for application of the reduced horizontal separation minima.

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APPENDIX G

Example Safety Assessment

South China Sea Collision Risk Model and Safety Assessment

1. Introduction

1.1 The South East Asia Safety Monitoring Agency (SEASMA), an En-route Monitoring Agency (EMA), is responsible for supporting continued safe use of the six major air traffic service routes in South China Sea international airspace. This support consists of discharging the EMA duties listed in the Asia/Pacific En-route Monitoring Agency Handbook.

1.2 The purpose of this appendix is to present an example of a safety assessment, as conducted by SEASMA on the six major South China Sea routes, together with the collision risk model used, to assess compliance with APANPIRG-agreed Target Level of Safety (TLS) values for the maintenance of lateral and longitudinal separation standards. The examination period covered is 1 May 2008 through 30 April 2009.

2. Background

2.1 The six South China Sea routes – L642, M771, N892, L625, N884 and M767 – were introduced in November 2001 in order to relieve congestion in the airspace. At the same time, State approval for Required Navigation Performance 10 (RNP 10) (now RNAV 10 under Performance Based Navigation (PBN) terminology) became mandatory for operation at or above flight 290 (FL 290).

2.2 This performance requirement was the basis for employing a minimum lateral separation standard of 60NM between-route centerlines. As shown in Table 1, the six routes are organized into three route-pairs to serve principal origin destination points, no pre-departure clearance (No-PDC) flight levels by route and some information about routes crossing the RNAV routes.

Route	Principal Service	Direction of Flow	No-PDC Flight Levels
RNAV L642	Hong Kong/Singapore-Kuala Lumpur	Northeast-southwest	310, 320, 350, 360, 390 and 400
RNAV M771	Singapore-Kuala Lumpur /Hong Kong	Southwest-northeast	Same as L642
RNAV N892	Northeast Asia-Taiwan/Singapore	Northeast-southwest	Same as L642
RNAV L625	Singapore /Northeast Asia-Taiwan	Southwest-northeast	Same as L642
RNAV N884	Singapore /Manila	Southwest-northeast	Same as L642
RNAV M767	Manila/Singapore	Northeast-southwest	Same as L642
Crossing Routes	Various	Bidirectional	Dependent upon route

Table 1: Characteristics of Air Traffic Service Routes in South China Sea

2.3 The longitudinal separation minimum published for the six routes in November 2001 was 10 minutes with Mach Number Technique (MNT), or 80NM RNAV.

2.4 Radar monitoring of horizontal plane navigational performance was initiated with introduction of the RNAV routes. The enabling Letter of Agreement (LOA) – signed by China, Hong Kong China, Indonesia, Malaysia, Singapore, Thailand, Vietnam, and Philippines – specified details concerning the categories of errors to be monitored and reported to Singapore on a monthly basis. The LOA also called for reporting associated counts of flights monitored.

2.5 In anticipation of horizontal-plane separation changes being pursued by the ICAO South-East Asia RNP Task Force (RNP-SEA/TF), the LOA was revised in 2008 to formalize certain monitoring activities which had been carried out previously on an informal basis. Table 2 indicates the fixes where monitoring is taking place under the revised LOA.

Route	Fixes	Monitoring Authority
L642	ESPOB to ENREP	Singapore
M771	DULOP and DUMOL	Hong Kong, China
N892	MELAS and MABLI	Singapore
L625	AKOTA and AVMUP	Philippines
N884	LULBU and LEGED	Philippines
M767	TEGID to BOBOB	Singapore

Table 2: Monitored Fixes in South China Sea Airspace

2.6 Since adoption of the original LOA, all instances of certain types of lateral and longitudinal errors have been reported to Singapore. The specifics of error-reporting are shown in Table 3. As will be noted, monitoring systems include automatic dependent surveillance – contract (ADS-C) and position reports, in addition to radar.

Type of Error	Category of Error	Criterion for Reporting
Lateral deviation	Individual-aircraft error	15NM or greater magnitude
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Infringement of longitudinal separation standard based on routine position reports
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Expected time between two aircraft varies by 3 minutes or more based on routine position reports
Longitudinal deviation	Aircraft-pair (Time-based separation applied)	Pilot estimate varies by 3 minutes or more from that advised in a routine position report
Longitudinal deviation	Aircraft-pair (Distance-based separation applied)	Infringement of longitudinal separation standard, based on ADS, radar measurement or special request for RNAV position report
Longitudinal deviation	Aircraft-pair (Distance-based separation applied)	Expected distance between an aircraft pair varies by 10NM or more, even if separation standard is not infringed, based on ADS, radar measurement or special request for RNAV position report

Table 3. Reporting Criteria for South China Sea Monitoring Programme

2.7 The monitoring criteria in Table 3 were chosen to support eventual work by the RNP-SEA/TF to introduce PBN separation standards, specifically RNAV 10-based 50NM lateral and longitudinal separation and RNP 4-based 30NM lateral and longitudinal separation. On 2 July 2008, the first of these separation reductions was introduced: the lateral separation standard between L642 and M771 was changed to 50NM and the preferred basis for longitudinal separation on these routes was changed to distance from time, with the minimum longitudinal separation standard between co-altitudes pairs reduced to 50NM.

3. Results of Data Collection

3.1 Table 4 shows the record of ANSP reporting of observed large errors and corresponding traffic counts covered by the South China Sea monitoring programme LOA (2008 revision) for the period May 2008 through April 2009.

Month	Report received from:		
	Hong Kong, China	Philippines	Singapore
May 2008	Yes	No	Yes
June 2008	Yes	No	Yes
July 2008	Yes	No	Yes
August 2008	Yes	Yes	Yes
September 2008	Yes	Yes	Yes
October 2008	Yes	Yes	Yes
November 2008	Yes	Yes	Yes
December 2008	Yes	Yes	Yes
January 2009	Yes	Yes	Yes
February 2009	Yes	Yes	Yes
March 2009	Yes	Yes	Yes
April 2009	Yes	Yes	Yes

Table 4. Record of ANSP Reporting by Month for Period May 2008 through April 2009

3.2 Reported Traffic Counts for May 2008 through April 2009 Monitoring Period

3.2.1 Table 5 presents the total traffic counts reported by month transiting all South China Sea monitoring fixes.

Monitoring Month	Total Monthly Traffic Count Reported Over Monitored Fixes	Cumulative 12-Month Count of Traffic Reported Over Monitored Fixes Through Monitoring Month
May 2008	8123	81591
June 2008	7743	83239
July 2008	8423	85383
August 2008	7568	86638
September 2008	7293	87800
October 2008	7673	89029
November 2008	6576	89457
December 2008	6665	89597
January 2009	7244	90880
February 2009	6380	89434
March 2009	7016	88438
April 2009	6603	87307

Table 5. Monthly Count of Monitored Flights Operating on South China Sea RNAV Routes

3.3 Reports of LLD for May 2008 to April 2009 Monitoring Period

3.3.1 There were no reported LLDs during the period May 2008 through April 2009.

3.3.2 Table 6 below presents the cumulative totals of LLDs in a manner similar to the traffic counts of table 5.

Monitoring Month	Cumulative 12-Month Count of LLDs Reported Over Monitored Fixes Through Monitoring Month
May 2008	2
June 2008	2
July 2008	2
August 2008	2
September 2008	2
October 2008	2
November 2008	1
December 2008	0
January 2009	0
February 2009	0
March 2009	0
April 2009	0

Table 6. Monthly Count of LLDs on South China Sea RNAV Routes

3.4 Reports of LLEs for May 2008 through April 2009 Monitoring Period

3.4.1 No ANSP reported an LLE in any of the categories shown in table 3 during the monitoring period.

4 **The Collision risk model**

4.1 Lateral Collision risk model: Compliance with Lateral TLS Value

4.1.1 Currently, the lateral separation standard between RNAV routes L642 and M771 is 50NM and 60NM otherwise for the other RNAV routes. The form of the lateral collision risk model used in assessing the safety of operations on the South China Sea RNAV routes is:

$$N_{ay} = P_y(S_y)P_z(0)\frac{\lambda_x}{S_x}\left\{E_y(\text{same})\left[\frac{|\bar{\dot{x}}|}{2\lambda_x} + \frac{|\dot{y}(S_y)|}{2\lambda_y} + \frac{|\bar{\dot{z}}|}{2\lambda_z}\right] + E_y(\text{opp})\left[\frac{\bar{V}}{\lambda_x} + \frac{|\dot{y}(S_y)|}{2\lambda_y} + \frac{|\bar{\dot{z}}|}{2\lambda_z}\right]\right\} \quad (1)$$

4.1.3 Table 7 presents the following descriptive information concerning equation (1) and its use in the ongoing assessment of RNAV-route lateral collision risk compliance with the APANPIRG-agreed TLS value of 5×10^{-9} fatal accidents per flight hour: (a) parameter definition, (b) parameter estimate value used in compliance assessment and (c) source for value of parameter estimate.

4.1.4 It should be noted that the value for the opposite-direction lateral occupancy parameter, a measure of the proximity of co-altitude aircraft on laterally adjacent routes, shown in table 7 has been updated based on the December 2008 TSD. The value is based solely on the passings observed between aircraft operating on L642 and M771 and is considered conservative, that is, leading to a higher lateral collision risk estimate than might be the case if operations on all RNAV routes were used in developing an occupancy estimate. Because of the opposite-direction flow on a pair of RNAV routes, no value of $|\bar{\dot{x}}|$, the same-direction relative along-track speed of a co-altitude aircraft pair on laterally adjacent routes, is presented.

Model Parameter	Definition	Value Used in TLS Compliance Assessment	Source for Value
N_{ay}	Risk of collision between two aircraft with planned 50NM lateral separation	5.0×10^{-9} fatal accidents per flight hour	TLS adopted by APANPIRG for changes in separation minima
S_y	Lateral separation minimum	50NM	Current lateral separation minimum between L642 and M771; used as common South China Sea lateral separation standard in compliance assessment
$P_y(50)$	Probability that two aircraft assigned to parallel routes with 50NM lateral separation will lose all planned lateral separation	2.69×10^{-9}	Value required to meet exactly the APANPIRG-agreed TLS value using equation (1), given other parameter values shown in this table.
λ_x	Aircraft length	0.0399NM	Based on December 2008 TSD operations on L642/M771
λ_y	Aircraft wingspan	0.0329NM	
λ_z	Aircraft height	0.0099NM	
$P_z(0)$	Probability that two aircraft assigned to same flight level are at same geometric height	0.538	Commonly used in safety assessments
S_x	Length of half the interval, in NM, used to count proximate aircraft at adjacent fix for occupancy estimates	120NM, equivalent to the +/- 15-minute pairing criterion	Arbitrary criterion which does not affect the estimated value of lateral collision risk
$E_y(\text{same})$	Same-direction lateral occupancy	0.0	Result of direction of traffic flows on each pair of RNAV routes
$E_y(\text{opp})$	Opposite-direction lateral occupancy	0.78	Based on December 2008 TSD; only operations on L642/M771 used to derive estimate
$\bar{V}$	Individual-aircraft along-track speed	483.9 knots	Combined December 2008 TSD
$ \dot{y}(S_y) $	Average relative lateral speed of aircraft pair at loss of planned lateral separation of S_y	75 knots	Conservative value based on assumption of waypoint insertion error
$ \dot{z} $	Average relative vertical speed of a co altitude aircraft pair assigned to the same route	1.5 knots	Conservative value commonly used in safety assessments

Table 7 - Summary of Risk Model Parameters Used in Lateral Safety Assessment

4.2 Longitudinal Collision Risk model: Compliance with Longitudinal TLS Value

4.2.1 Currently, the longitudinal separation standard for co-altitude aircraft on RNAV routes, L642 and M771, is 50NM; the longitudinal separation standard for the other RNAV routes is either 10 minutes with Mach Number Technique (MNT) or 80NM.

4.2.2 The form of the longitudinal collision risk model used in assessing the safety of operations on the South China Sea RNAV routes is:

$$N_{ax} = P_y(0)P_z(0)\frac{2\lambda_x}{|\dot{x}|}\left[\frac{|\dot{x}|}{2\lambda_x} + \frac{|\dot{y}(0)|}{2\lambda_y} + \frac{|\dot{z}|}{2\lambda_z}\right] \times \sum_{k=m}^N \sum_{K=k}^M Q(k) \times P(K > k) \quad (2)$$

4.2.3 Table 8 below presents information about the parameters of the longitudinal collision risk model not already discussed in Table 7.

Model Parameter	Definition	Value Used in TLS Compliance Assessment	Source for Value
N_{ax}	Risk of collision between two co-altitude aircraft with planned longitudinal separation equal to at least the applicable minimum longitudinal separation standard	5.0×10^{-9} fatal accidents per flight hour	TLS adopted by APANPIRG for changes in separation minima
$P_y(0)$	Probability that two aircraft assigned to same route will be at same across-track position	0.2	May 2008 safety assessment of 50NM longitudinal separation minimum presented at RASMAG/9
$ \dot{x}(m) $	Minimum relative along-track speed necessary for following aircraft in a pair separated by m at a reporting point to overtake lead aircraft at next reporting point	100 knots	RASMAG/9 safety assessment
$ \dot{y}(0) $	Relative across-track speed of same-route aircraft pair	1 knot	RASMAG/9 safety assessment
m	Longitudinal separation minimum	50NM	Current preferred longitudinal separation minimum on RNAV routes L642 and M771; used for all RNAV routes in TLS compliance assessment

Model Parameter	Definition	Value Used in TLS Compliance Assessment	Source for Value
N	Maximum initial longitudinal separation between aircraft pair which will be monitored by air traffic control in order to prevent loss of longitudinal separation standard	150NM	Arbitrary value of actual initial separation beyond which there is negligible chance that actual longitudinal separation will erode completely before next air traffic control check of longitudinal separation based on position reports
M	Maximum longitudinal separation loss over all pairs of co-altitude aircraft	Dependent on initial longitudinal separation distance	RASMAG/9 safety assessment showed that amount of initial longitudinal separation lost depends upon initial separation value
$Q(k)$	Proportion of aircraft pairs with initial longitudinal separation k	Initial distribution of longitudinal separation for RNAV routes L642 and M771 used in RASMAG/9 safety assessment	Combined December 2007 TSD
$P(K > k)$	Probability that a pair of same-route, co-altitude aircraft with initial longitudinal separation k will lose at least as much as k longitudinal separation before correction by air traffic control	Values derived to satisfy TLS of 50NM longitudinal separation minimum presented at RASMAG/9	Result of direction of traffic flows on each pair of RNAV routes

Table 8. Summary of Additional Risk Model Parameters Used in Longitudinal Safety Assessment

5. Safety Assessment

5.1 Results from the monitoring programme found in paragraph 3 have shown consistently that adherence to track and maintenance of inter-aircraft longitudinal separation are good in the airspace. Since initiation of monitoring in November 2001, there have been only two instances of a lateral deviation of 15NM or more from centerline and no reported large longitudinal error reported to Singapore.

5.2 Since January 2005, States have monitored roughly 300,000 flights while recording the two instances of large lateral deviations and no instances of reportable longitudinal errors. A reasonable conclusion from these results is that, whatever the values that pertain in the lateral and longitudinal dimensions, the rates of occurrence of large horizontal-plane navigational errors are so low that they do not evidence themselves frequently in the number of flights monitored.

5.3 The few instances of reported large errors are consistent with several facts about the South China Sea operational environment, as follows:

- the six RNAV routes have been fixed at the same coordinates since November 2001,
- more than 97 percent of operations are conducted by commercial operators regularly flying the routes,
- more than 98 percent of the operations are conducted using aircraft types of the most recent generations, and
- more than 60 percent of South China operations are conducted on the L642 and M771 routes where radar surveillance and very high frequency radio coverage are extant throughout almost all of the route lengths, providing the opportunity for controller intervention in the event that an aircraft or aircraft pair begins to stray.

5.4 Given the small number of reported large errors, the estimation of lateral and longitudinal collision risk is more challenging. This is because it is more difficult to estimate the two key probabilities on which the risk values depend: the probability that a pair of aircraft will lose, respectively, all planned 50 NM lateral separation and 50 NM minimum longitudinal separation – repressed symbolically as $P_y(50)$ and $P_x(S_x \mid S_x \geq 50)$.

5.5 The approach taken to estimating the two probability values is the same. It will be described for the case of lateral separation; differences in the outcome for longitudinal separation will be discussed after the lateral-separation case is explained.

5.6 Direct estimation of Lateral Collision Risk

5.6.1 This approach considers that the process of monitoring a flight has the following properties:

- a flight's performance observed at a monitored fix is the same as its performance during that portion of its operation where performance is not monitored formally,
- from the standpoint of the monitoring programme, there are only two possible outcomes for a flight: either observing a 15-NM or greater magnitude lateral deviation – the monitoring criterion for reporting a large lateral deviation in South China Sea airspace – or not observing a large lateral deviation
- p is the probability that a large lateral deviation occurs during a flight,
- p is constant from flight to flight
- Monitoring programme observation of a large lateral deviation for a flight does not influence the chance that a large lateral deviation will be observed for any other flight.

5.6.2 As a result, monitoring a flight can be considered to be a Bernoulli trial with probability, p , of “success” (observing a large lateral deviation) and probability $q = (1 - p)$, of “failure” (observing a lateral error less than 15NM in magnitude). Thus, the statistical distribution describing the probability of obtaining k “successes” (or large lateral deviations) in M successive trials (or monitoring observations) is the binomial:

$$b(M; k, p) = \binom{M}{k} p^k (1-p)^{(M-k)} = (M!)/((M-k)! \cdot (k!))$$

where, for example, $k! = k \cdot (k-1) \cdot (k-2) \dots 2 \cdot 1$

The expected number of successes in n trials is given by:

$$M \cdot p$$

For Bernoulli trials, it is well known that, if the number of trials, M , increases while the probability, p , of success from trial to trial decreases such that the product expected number of successes, $M \cdot p$, remains sensibly constant, the probability of k successes in M trials, $b(M; k, p)$, can be approximated by the Poisson distribution, $p(k; \lambda)$, where:

$$p(k; \lambda) = e^{-\lambda} \lambda^k / (k!)$$

The parameter, λ , termed as the “intensity parameter”, is the expected value of the distribution, or expected number of successes, given by:

$$\lambda = M \cdot p$$

As can be seen by comparing the two, the expected value of the binomial distribution, $M \cdot p$, and the Poisson distribution, $\lambda = M \cdot p$, are the same.

It is common to refer to p as the “success rate.”

5.6.3 The Poisson distribution has application in estimating the number of arrivals of requests for service at a telephone switchboard, for example, higher values of λ will correspond to a more intense traffic at the switchboard. In the case of the South China Sea monitoring programme, the Poisson distribution is used to describe the number of large lateral deviations observed for M flights in the regions of the monitored fixes.

5.6.4 It is important to recognize that many values of λ could have produced the observed monitored results. The first recorded instance of a large lateral deviation was November 2007. From January 2005 to that time, roughly 167,000 flights were monitored without observation of a large lateral deviation. The occurrence of no errors during this period would have been consistent with a value of $\lambda = 0.0$, which would have corresponded to a success rate, p , of 0.0. In addition, it is intuitive that small “success” rates greater than 0.0 could have produced no observed large lateral deviations in 167,000 trials. For example, it is highly likely that a success rate, p , or rate of large lateral deviations, of 1×10^{-16} per flight could have produced no large lateral deviations in 167,000 monitored flights, since the expected number of large lateral errors, or successes, with this error rate is given by:

$$\lambda = M \cdot p = \text{expected number of successes}$$

or:

$$\begin{aligned} \lambda &= p \cdot n = (1 \times 10^{-16} \text{ large lateral deviations/flight}) \cdot (167,000 \text{ flights}) \\ &= 1.67 \times 10^{-11} \end{aligned}$$

which is nearly 0 successes, or observed large lateral deviations.

5.6.5 The process of increasing the possible error rate and determining if the expected number of large lateral errors in 167,000 trials would be consistent with the number observed could be continued until some reasonable upper bound is determined. That upper rate value could then be used as a conservative estimate of the true, but unknown, error rate which is consistent with the monitored results.

5.6.6 The procedure used to produce an upper bound on the rate of large lateral deviations is to determine the value of the Poisson-distribution parameter, λ , which corresponds to a probability of 0.05 that the true, but unknown, rate of large lateral deviations would lead to more errors than the k errors, observed during a monitoring period. That is, to determine a value of λ such that:

0.05 = Probability of more than k errors

$$= \sum_{N>k}^{\infty} p(N; \lambda)$$

Since $p(k; \lambda)$ is a probability distribution,

$$\sum_{N>k}^{\infty} p(N; \lambda) = 1 - \sum_{N=0}^k p(N; \lambda)$$

Thus, the expression can be re-written into the computationally more convenient form:

$$\sum_{N=0}^k p(N; \lambda) = 1 - 0.05 = 0.95$$

For the period from November 2001 until November 2007, the number of observed large lateral deviations was 0 each month. That is, k took on the value 0 for each month. In these cases, the expression above becomes:

$$\begin{aligned} 0.95 &= \sum_{N=0}^k p(N; \lambda) \\ &= \sum_{N=0}^0 p(N; \lambda) \\ &= p(k=0; \lambda) \\ &= e^{-\lambda} \lambda^k / (k!) \\ &= e^{-\lambda} \lambda^0 / (0!) \end{aligned}$$

Since both λ^0 and $(0!)$ evaluate to 1, the expression above reduces to

$$0.95 = e^{-\lambda}$$

or,

$$\lambda = -\ln(0.95)$$

where $\ln(0.95)$ is the Natural logarithm of 0.95

Since the value of $-\ln(0.95)$ is roughly 0.05,

$$\lambda \approx 0.05$$

or, taking the approximate value as exact for ease of use and substituting the expression for λ in terms of p and M ,

$$\begin{aligned}\lambda &= 0.05 \\ p \cdot M &= 0.05 \\ p &= 0.05/M\end{aligned}$$

where

p is the error rate per flight, and

M is the number of monitored flights

5.6.7 In the method to estimate South China Sea lateral risk, the cumulative numbers of flights and reported large lateral deviations reported for the 12 months up to and including month N are used to estimate the lateral risk for month N . Thus, M is taken to be the total number of flights monitored within the last 12 months up to and including month N .

5.6.8 The two large lateral deviations were reported as single occurrences in November and December 2007. In the cases of the months November 2007 through November 2008, determination of the value of λ involves evaluation of the expression

$$0.95 = \sum_{N=0}^k p(N; \lambda)$$

for $k=1$ and $k=2$, depending upon the month from November 2007 through November 2008.

When $k=1$ or 2 , the expression is a transcendental equation in λ , most easily solved numerically. The values of λ for $k=0, 1$ and 2 are 0.051293, 0.35540 and 0.81770, respectively.

This approach yields a proportion, p , of lateral deviations at least as large in magnitude as 15NM for each month of the monitoring programme.

5.6.9 It is now necessary to impose a further assumption in order to obtain a value for $P_y(50)$, the probability that two aircraft with planned lateral separation of 50NM lose all planned lateral separation, for risk computation. Many years of experience by a number of States in analyzing lateral navigational performance has resulted in agreement on a general form for the distribution of lateral errors. The distribution, usually termed a “double double exponential” is a combination of two double exponential, or First Laplace, distributions which can be represented symbolically as:

$$f(y; \beta_1, \beta_2) = ((1 - \alpha) / 2\beta_1) e^{-|y|/\beta_1} + (\alpha / 2\beta_2) e^{-|y|/\beta_2}$$

for $-\infty < y < \infty$

$$\beta_2 > \beta_1 > 0$$

$$\alpha > 0$$

5.6.10 The first exponential is usually referred to as the “core” distribution since it is intended to describe typical lateral navigational performance; the second is generally called the “tail” distribution since it is intended to model the atypical, large lateral errors. For each distribution, the standard deviation, σ , is related to the parameter, β , by:

$$\beta = \sigma / 2$$

The parameter, α , is the weight of the larger-error component of the overall distribution.

The proportion of the overall distribution in excess of some absolute value of lateral deviation, Y , is given by:

$$\text{Probability } \{y \geq |Y|\} = (1 - \alpha)e^{-|Y|/\beta_1} + \alpha e^{-|Y|/\beta_2}$$

The self-convolution of this distribution, $C(z)$, evaluated at the separation standard, S_y , is related to the probability of lateral overlap by

$$p_y(S_y) = 2\lambda_y \bullet C(S_y)$$

It is well known that if β_2 is much greater than β_1 , then

$$\text{Probability } \{y \geq |Y|\} = e^{-|Y|/\beta_2}$$

and

$$p_y(S_y) = (2\alpha\lambda_y / \beta_2) e^{-S_y / \beta_2}$$

Further, for a fixed value of α , the maximum value of $C(S_y)$ is reached when $\beta_2 = S_y$, expressed as $\alpha/(e \bullet S_y)$.

5.6.11 In the approach to estimating collision risk for South China Sea airspace, it has been assumed, conservatively, that the convolution will take on its maximum. Thus, for the value of $P_y(S_y)$ necessary to meet exactly the Target Level of Safety (TLS), the required value of α is thus:

$$(P_y(S_y) e \bullet S_y) / 2 \lambda_y$$

The approach, thus, reduces to determining whether the constraint that, for k large lateral deviations observed in M flights,

$$\lambda(k) / M = (1 - \alpha)e^{-|15|/S_y} + \alpha e^{-|15|/S_y}$$

can be satisfied for α which results in meeting exactly the TLS. Radar data collected in the Singapore FIR, although of a limited amount, indicates that the standard deviation of lateral deviations arising from typical navigational performance is 0.5NM to 1.0NM. Values in this range result in the value of $(1 - \alpha)e^{-|15|/S_y}$ to be negligible in comparison to $\alpha e^{-|15|/S_y}$. As a result,

$$\lambda(k) / M = \alpha e^{-|15|/S_y}$$

This constraint results in a computed value of α . The proportion by which the lateral collision risk differs from the TLS, multiplied by the TLS value, becomes the estimated lateral collision risk.

5.7 Estimation of Longitudinal Collision Risk

5.7.1 For the case of longitudinal collision risk estimation, the results from South China Sea monitoring indicate that there have been no reported instances of 3-minute or greater unexpected separation loss between a pair of co-altitude aircraft. These monitored data represent a sample of the convolution density function directly, rather than a sample of individual-aircraft deviation which then must go through the process of distribution identification and fitting in order to produce a sample convolution density function.

5.7.2 It is assumed that the unexpected loss of longitudinal decays exponentially as the value of unexpected separation loss increases. If x represents unexpected separation loss, this assumption results in using an exponential distribution to characterize the probability of unexpected longitudinal separation loss between a pair of co-altitude aircraft. Using $g(x)$ to represent distribution of unexpected longitudinal separation loss, the form of this distribution is:

$$g(x) = \varphi e^{-\varphi x}$$

5.7.3 In a manner similar to the approach for estimating lateral collision risk, the parameter φ is estimated from the proportion of 3-minute or greater unexpected longitudinal separation loss which is derived from the Poisson–variate assumption. Once determined, this exponential distribution is used in conjunction with the distribution of initial inter-aircraft separation determined from data collection to support longitudinal risk estimation.

5.8 Compliance with Lateral and Longitudinal TLS Values

5.8.1 Figure 1 below presents the results of taking the direct estimation shown above for the monitoring period May 2008 to April 2009

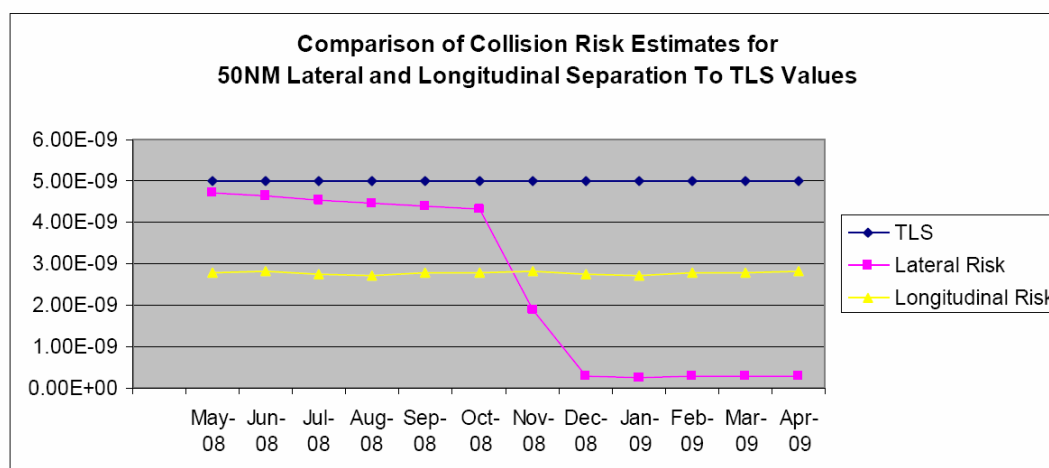


Figure 1. Assessment of Compliance with Lateral and Longitudinal TLS Values Based on Navigational Performance Observed During South China Monitoring Programme

5.8.2 As can be seen, both the estimates of lateral and longitudinal risk during the monitoring showed compliance with the TLS during all months of the monitoring period.

APPENDIX H

Sample Content and Format for Collection of Sample of Traffic Movements

The following table lists the information required for each flight in a sample of traffic movements.

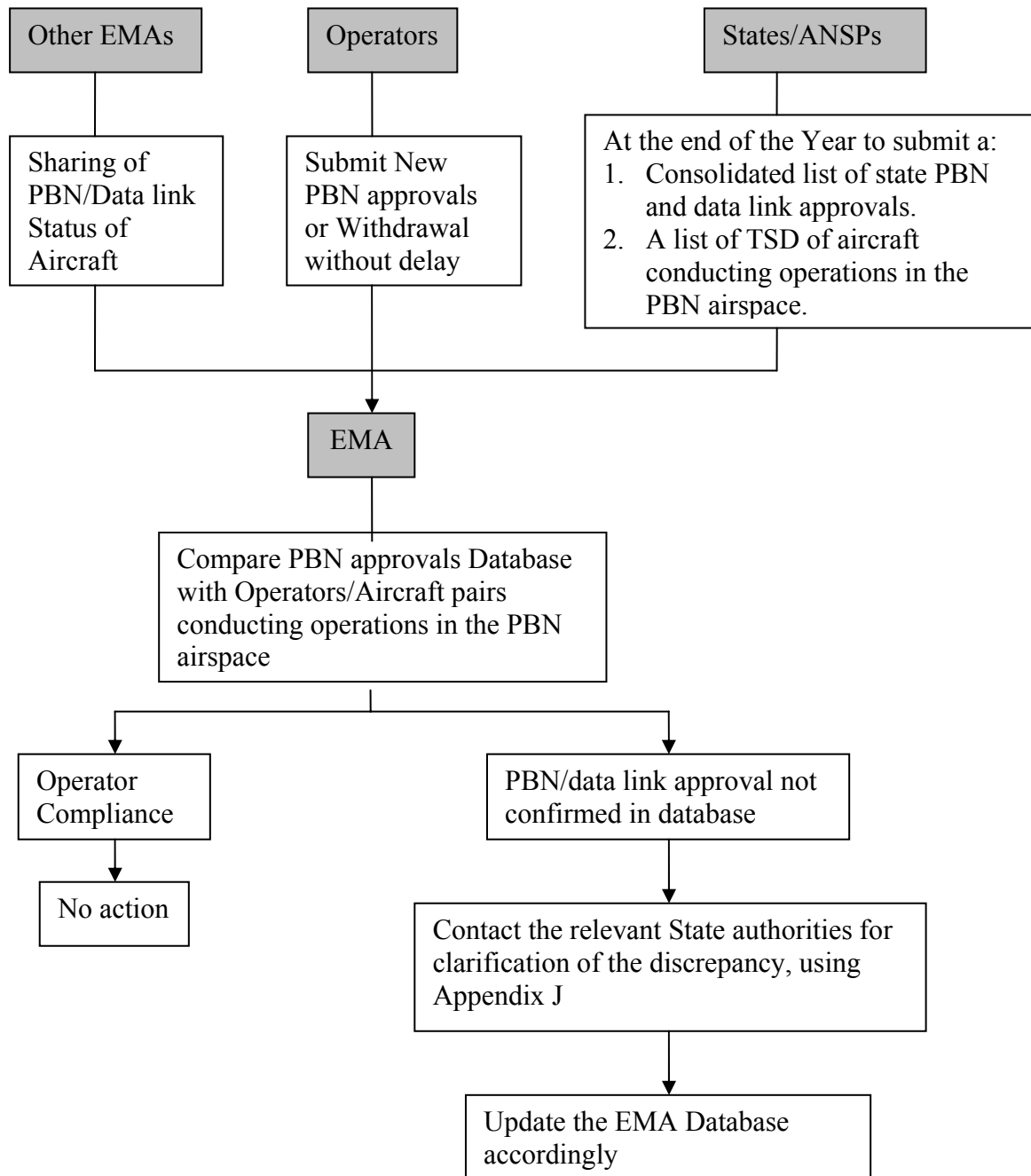
INFORMATION FOR EACH FLIGHT IN THE SAMPLE

The information requested for a flight in the sample is listed in the following table with an indication as to whether the information is necessary or is optional:

FIELD	EXAMPLE	MANDATORY OR OPTIONAL
Date (dd/mm/yyyy)	08/05/2007 for 8 May 2007	MANDATORY
Aircraft Call Sign	XXX704	MANDATORY
Aircraft Registration Mark	VH-ABC	MANDATORY
PBN Approval type	RNP 4	MANDATORY
Aircraft Type	B734	MANDATORY
Origin Aerodrome	WMKK	MANDATORY
Destination Aerodrome	RPLL	MANDATORY
Entry Fix into Airspace	MESOK	MANDATORY
Time at Entry Fix (UTC)	0225 or 02:25	MANDATORY
Flight Level at Entry Fix	330	MANDATORY
Assigned Mach number at Entry Fix	M0.77	OPTIONAL
Route after Entry Fix		MANDATORY
Exit Fix from Airspace	NISOR	MANDATORY
Time at Exit Fix (UTC)	0401 or 04:01	MANDATORY
Flight Level at Exit Fix	330	MANDATORY
Assigned Mach number at Exit Fix	M0.77	OPTIONAL
Route before Exit Fix		MANDATORY
First Fix Within the Airspace OR First Airway Within the Airspace	MESOK OR G582	OPTIONAL
Time at First Fix (UTC)	0225 or 02:25	OPTIONAL
Flight Level at First Fix	330	OPTIONAL
Route after first fix		OPTIONAL
Second Fix Within the Airspace OR Second Airway Within the Airspace	MEVAS OR G577	OPTIONAL
Time at Second Fix (UTC)	0250 or 02:50	OPTIONAL
Flight Level at Second Fix	330	OPTIONAL
Route after second fix		OPTIONAL
(Continue with as many Fix/Time/Flight-Level/Route entries as are required to describe the flight's movement within the airspace)		OPTIONAL

APPENDIX I

Monitoring Operator Compliance with State Approval Requirements Flow Chart



APPENDIX J

Letter To State Authority Requesting Clarification Of The State En-route PBN or Data Link Approval Status Of An Operator

When the en-route PBN or data link approval status shown in filed flight plan is not confirmed in an EMA's database of State approvals, a letter similar to the following should be sent to the relevant State authority.

<STATE AUTHORITY ADDRESS>

1. The (EMA name) has been established by the ICAO Asia/Pacific Regional Airspace Safety Monitoring Advisory Group (RASMAG) to support safe implementation and use of the horizontal-plane separation in (airspace where the EMA has responsibility), in accordance with guidance published by the International Civil Aviation Organization.

2. Among the other activities, the (EMA name) conducts a comparison of the State en-route PBN and data link approval status, provided by an operator to an air traffic control unit, to the record of State en-route PBN and data link approval available to us. This comparison is considered vital to ensuring the continued safe use of horizontal-plane separation.

3. This letter is to advise you that an operator which we believe is on your State registry provided notice of State en-route PBN or data link approval which is not confirmed by our records. The details of the occurrence are as follows:

Date:
Operator name:
Aircraft flight identification:
Aircraft type:
Registration mark:
Filed PBN Approval type:
Filed Data Link Approval Status:
ATC unit receiving notification:

4 We request that you advise this office of the en-route PBN and data link approval status of this operator. In the event that you have not granted an en-route PBN or data link approval to this operator, we request that you advise this office of any action which you propose to take.

Sincerely,

(EMA official)

APPENDIX K

Scrutiny Group Guidance

1. Composition

The Scrutiny Group requires a diverse set of subject-matter expertise. The Scrutiny Group could consist of subject matter experts in air traffic control, aircraft operation, operational pilot groups, regulation and certification, data analysis, and risk modeling from the involved regions.

If necessary, a working group could be formed to discuss specific subject matters, and might consist of subject matter experts and specialists from member States, EMA, CRA, etc. The working group would be responsible for executing the preparatory work for a meeting of the Scrutiny Group, including the analysis and categorization of selected LLDs and LLEs.

2 Purpose

The goal of the Scrutiny Group is to examine reports of LLDs and LLEs from the EMA monitoring programme with the objective of determining which reports from the monitoring programme will influence the risk of collision associated with the reduced horizontal separation. For example, the Scrutiny Group could examine possible LLDs and LLEs affected by the reliability and accuracy of the avionics within the aircraft and/or by external meteorological events and/or by the human element in the development of the safety assessment.

Once the Scrutiny Group has made its initial determination, the data are reviewed to look for performance trends. If any adverse trends exist, the Scrutiny Group may make recommendations to either ANSPs or regulatory authorities for reducing or mitigating the effect of those trends as a part of ongoing reduced horizontal separation safety oversight.

3 Process

The primary method employed is to examine existing databases as well as other sources and analyze events resulting in:

- Lateral tracking errors based on a deviation of 15 NM either side of track, or a lesser deviation value determined by the EMA as necessary where lower value PBN specifications are used
- Variations of longitudinal separation of three minutes or more; or
- Variations of longitudinal separation of 10 NM or more.

These events are usually the result of operational errors, navigation errors or meteorologically influenced events etc. The largest source of reports useful for these purposes comes from existing reporting systems, such as the reporting system established by regional agreement.

The Scrutiny Group should meet to analyze reports of LLDs and LLEs so that adverse trends can be identified quickly and remedial actions can be taken to ensure that risk due to operational errors has not increased following the implementation of reduced horizontal separation.

4 Analysis and Methodology

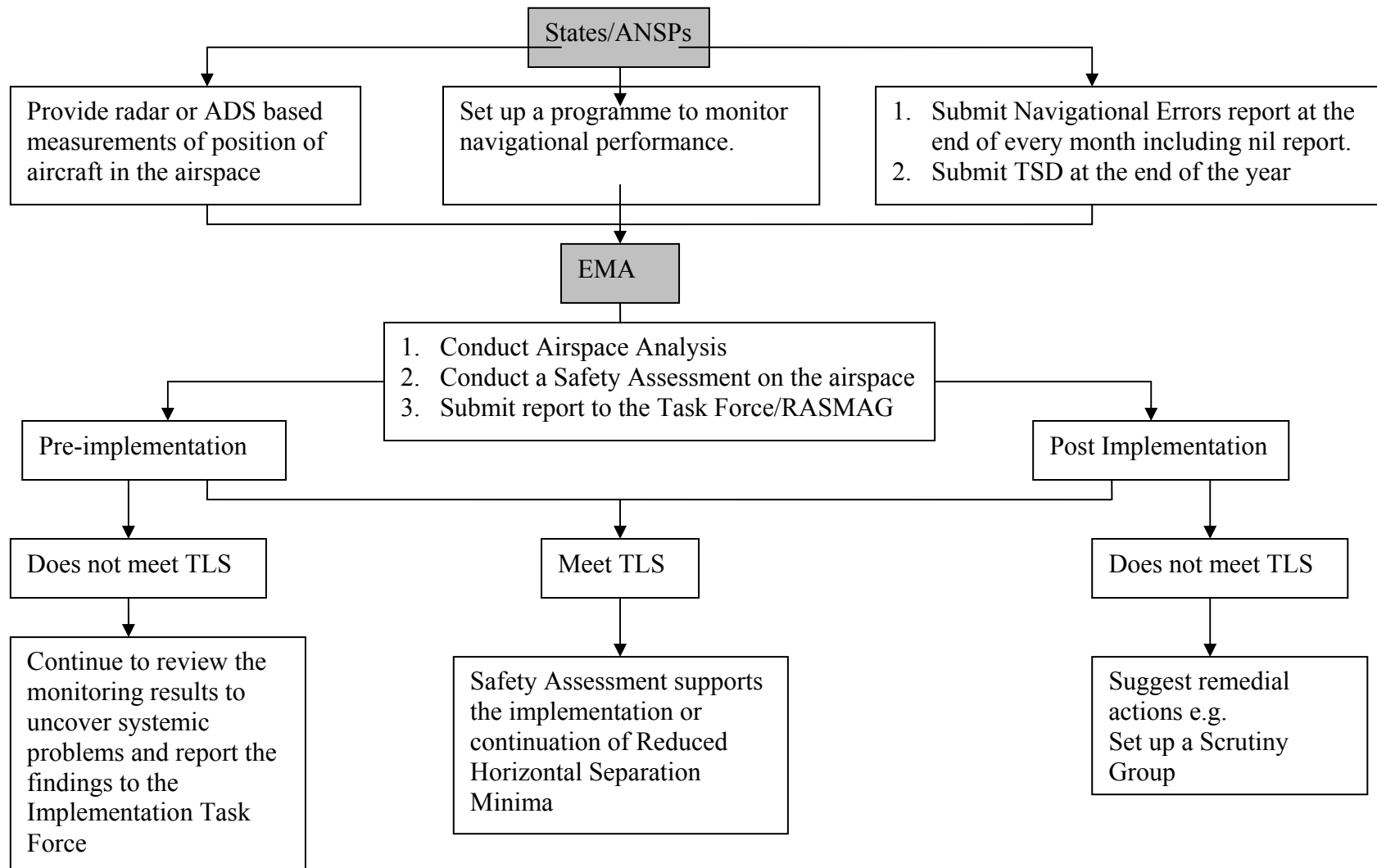
The working group is tasked to analyse the reports of interest and examine the category assigned to each event. The event categories can be found in the EMA handbook, Appendix E.

The working group relies on its expert judgment and operational experience to analyse these reports. Upon completion of their preliminary analysis, the working group will present the results to the Scrutiny Group.

The Scrutiny Group shall examine its working group's analysis results and take follow-up action as required.

APPENDIX L

Pre/Post-Implementation Reduced Horizontal Separation Minima Flow Chart



Agenda Item 3.4: CNS/MET

Agenda item 3: Regional air navigation planning and implementation issues

3.4 CNS/MET matters

3.4.1 The meeting reviewed the outcomes of the Thirteenth Meeting of Communications, Navigation and Surveillance/Meteorology Sub-Group (CNS/MET SG/13) of Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) held in Bangkok from 20 to 24 July 2009. The meeting noted with appreciation the work done by the Sub-Group. The meeting also discussed the CNS/MET related issues presented to the meeting and took following actions on the report of the CNS/MET SG/13.

Follow-up action on APANPIRG Conclusion 18/23

3.4.2 The meeting recalled APANPIRG Conclusion 18/23 recommending discontinuation of the *Regional Plan for New CNS/ATM Systems* and inviting ICAO to develop detailed proposal for incorporating the useful information contained in the discontinued Plan into Asia Pacific Air Navigation Plan (Doc 9673). The meeting endorsed the following comments as a result of review by the Secretariat:

- To retain and update 'Figure 2-1 General Transition Issues (Page 2-2 and 2-3) and 'Table 10-2 Generic Table for En-route Operations' (Page 10-5 to 10-9) in the ATM field;
- To retain the relevant MET information as Regional Guidance Material in consultation with Headquarters; and
- No CNS related information was considered necessary to be transferred to any other document.

Aeronautical Fixed Service

Review Report of the Fourth Meeting of the ATN Implementation Coordination Group (ATNICG/4)

3.4.3 The meeting noted with appreciation the tasks accomplished by the ATNICG/4 Meeting which was hosted by Civil Aviation Authority of Singapore from 4 to 8 May 2009.

3.4.4 The meeting noted that no amendment to the Terms of Reference of ATNICG was identified. The meeting decided to endorse the updated Subject/Tasks List for ATNICG and adopted the following decision:

Decision 20/26 - Revision of Subject/Tasks List of ATNICG

That, the revised Subject/Tasks List of ATNICG provided in **Appendix A** to the Report on Agenda Item 3.4 be adopted.

IDRP Routing Policy

3.4.5 The meeting agreed that Version 2.0, the current version of the Asia/Pacific IDRP Routing Policy does not provide for an optimal routing of CLNP PDUs for some sites like Salt Lake City, USA and Moscow, Russian Federation, etc. which have multiple connections into Asia/Pacific Region. In addition, it was identified that in case of a backbone link failure, a non-backbone alternative path might be selected by the IDRP. To overcome these problems, the meeting

recommended adoption of the revised version, Version 3.1 of the Asia/Pacific IDRP Routing Policy developed by ATNICG/4.

AMHS/ATN Network Management Operational Procedure Guidelines

3.4.6 To satisfy the requirements of APANPIRG Conclusion 15/15, AMHS/ATN Network Management Operational Procedure Guidelines was developed and presented to the meeting. It was noted that the document covered areas deemed necessary for efficient and effective operation of regional and global AMHS. It was clarified that the document does not include any information about performance requirements or specifications; it covers only the operational procedure issues.

AMHS Conformance Testing Document (AMHS Manual)

3.4.7 The meeting was informed that with the release of EUR AMHS Manual Version 3.0 in April 2008, it had become necessary to revise Asia/Pacific guidance document on AMHS Conformance Testing (AMHS Manual) accordingly. The revised Manual was reviewed by the CNS/MET SG/13 meeting and was recommended for adoption by APANPIRG.

Security Requirements

3.4.8 Aeronautical Telecommunication Network Security Checklist, intended to support Asia/Pacific ATN Security Policy was presented to the meeting for its consideration. The meeting was informed that the Checklist may be used by the administrations and organizations to verify if their implemented system includes appropriate security measures. The ATNICG/4 recommended that the system may be put into operation after the Designated Approval Authority has ensured that the recommended Checklist is completed.

3.4.9 In view of the foregoing, the meeting adopted following Conclusion:

Conclusion 20/27 - ATN/AMHS Guidance Material

That, the following guidance materials for ATN/AMHS Implementation be adopted and published.

- Version 3.1 of the Asia/Pacific IDRP Routing Policy provided in **Appendix B** to the Report on Agenda Item 3.4;
- AMHS/ATN Network Management Operational Procedure Guidelines provided in **Appendix C**;
- Amended AMHS Conformance Testing (AMHS Manual provided in **Appendix D**; and
- Aeronautical Telecommunication Network Security Checklist provided in **Appendix E**.

Short term procedure for Global AMHS address coordination

3.4.10 The meeting was reminded about the procedure prescribed by ICAO through State Letter dated 14 April 2009 for the purpose of AMHS address coordination through EU AMC. The State Letter mentioned that the AMC implemented by EUROCONTROL under the aegis of the ICAO EUR Office (Paris) for all operational purposes and the ICAO AMHS MD Register loaded with AMC data to ensure consistency will only be used as the systems for the short-term address management.

3.4.11 It was also advised in the State Letter that the States should register their nominated users and these users need to be trained before they are actually allowed to enter data into AMC. On the issue of address management, ATNICG/4 was of the view that for the Asia/Pacific Region all the data going into the AMC database should be submitted through Aeronautical Radio of Thailand (the agency designated in Asia/Pacific Region for coordinating with EUROCONTROL AMC on matters related to AMHS). It was agreed that the procedure for submission of AMC data through Aerothai will be notified to States by ICAO Asia/Pacific Office through a State Letter.

3.4.12 The ATNICG/4 had proposed that a copy of the information submitted by the States to the AMC database should also be provided to ICAO Asia/Pacific Office. The meeting reviewed the recommendation made by ATNICG and adopted following Conclusion:

Conclusion 20/28 - Short-term procedure for Global AMHS address Coordination

That, ICAO request States to register their AMHS addresses with EUROCONTROL AMC through Aeronautical Radio of Thailand (Aerothai) and provide a copy of this information to ICAO Asia/Pacific Office.

AMHS Addressing Scheme

3.4.13 The meeting noted details of the AMHS address management domain in terms of Country (C), Administrative Domain (ADMD or A) and the Private Domain (PRMD or P) attributes. The two types of address schemes XF and CAAS were also explained in terms of these attributes. It was informed that a Regional AMHS Naming Register had been created to record the addressing schemes adopted by different States. The meeting urged the States to update information in respect of their administration in the Naming Register. The meeting also agreed that BBIS hubs should be equipped to process messages both with the XF and CAAS addressing schemes to ensure interoperability and adopted the following Conclusion:

Conclusion 20/29 - AMHS Addressing Scheme

That,

- a) States be urged to update information in respect of their administrations in the regional AMHS Naming Register; and
- b) States hosting BBIS hubs be requested to process both the XF and CAAS addressing schemes.

FASID Tables CNS-1B, CNS-1C and CNS-1E

3.4.14 The meeting reviewed FASID Tables CNS-1B for ATN Router Plan, CNS-1C for AMHS Routing Plan and CNS-1E for the AIDC Routing Plan updated by ATNICG/4 and Communication Co-ordination Meeting held in Shenyang, China from 3 to 5 June 2009. After reviewing the Tables, the meeting formulated following Conclusion:

Conclusion 20/30 - Revision of FASID Tables CNS-1B, CNS-1C and CNS-1E

That, FASID Tables CNS-1B, 1C and 1E for ATN Router Plan, AMHS Routing Plan and AIDC Routing Plan be replaced with the revised CNS Tables provided in **Appendices F, G and H** respectively to the Report on Agenda Item 3.4.

Performance Based Approach

3.4.15 The meeting appreciated the progress made in the implementation of ATN in the region and appreciated the contribution made by the ATNICG. The meeting also placed on record its appreciation for Civil Aviation Authority of Singapore for hosting the ATNICG meeting in Singapore Aviation Academy.

COM Coordination Meeting

3.4.16 The meeting was informed that a Communication Co-ordination Meeting, hosted by ATMB, China was held in Shenyang from 3 to 5 June 2009. The meeting discussed issues related to the AFS network and adopted five action items to improve the performance of the AFTN/ATS Direct Speech Circuits and AIDC between China, Democratic People's Republic of Korea and the Republic of Korea. Status of implementation of specific AFS circuits and difficulties faced in the implementation were also reviewed.

Telecommunications Evolution

3.4.17 The United States informed the meeting about the evolutions that are taking place in the AFS telecommunication infrastructure. It was informed that AFTN is gradually being replaced with AMHS, a system designed to distribute the flight plans globally, distribute meteorological data and support systems like Ocean Tracking System (OTS), ATS Inter-facility Data Communications (AIDC), Search and International Rescue, etc. It was highlighted that the emerging technologies are being adopted and implemented by various regions. Issues related to need for harmonized and coordinated implementation were raised and it was suggested that ATNICG should develop a Working Paper on regional coordinated approach. It was recognized that implementation of security measures and operational compatibility in the structure adopted by different regions was found to be complex.

Aeronautical Mobile Service (AMS)***Use of SATCOM Voice for ATS Communication (SCV)***

3.4.18 The meeting noted discussions regarding use of SCV for ATS Communication by the CNS/MET SG/13. A paper from Australia highlighted the reason why SCV was not recommended by APANPIRG for routine ATS communication which includes lack of message delivery standards (in both directions), lack of ATC infrastructure to support the operation and cost, reliability and security concerns, etc. It was proposed to develop standards to allow use of SCV for ATS purpose at global level. While discussing the proposal, the meeting reviewed the background information presented by the Secretariat on the position of APANPIRG regarding the use of SCV for emergency and non-routine ATS communication in addition to its AOC and public communication. The meeting also recalled relevant discussions at the twenty third meeting of the Informal south Pacific Air Traffic Service Coordinating Group (ISPACG/23) held from 26 to 27 March 2009 and also outcome of discussions on the use of SCV at the forty-fifth meeting of North Atlantic Systems Planning Group (NAT SPG) held from 23 to 26 June 2009. The meeting noted NAT SPG Conclusion 45/28 on amendment to the NAT Regional Supplementary Procedures (SUPPs) regarding the use of SATCOM voice for Air Traffic Service (ATS) Communication. The amendment proposal made provision to allow aircraft with installed avionics capable of SCV approved by the State of Operator or the State of Registry to use such equipment for ATS communications as an additional means to HF voice communications.

3.4.19 While some participants supported the proposal made by Australia, views were expressed that currently HF in some States does not have problem of congestion and hence there is no need to have secondary voice for HF. It was also indicated that use of SCV for ATS purposes would increase the workload of the controllers.

3.4.20 The meeting was also informed that technical SARPs for the use of AMSS including SCV have already been included in the relevant provisions. No further technical standard in terms of signal in air would be required to be developed for use of SCV for ATS purposes. It was noted that the development of guidance material and/or implementation guidelines to further progress the use of satellite voice communications is in the work programme of OPLINK Panel.

3.4.21 The meeting noted the information on the use of SCV systems in lieu of a second HF as provided by New Zealand. The weight of HF systems, the requirement for structural modifications of the aircraft etc. made the usage of SCV beneficial. It was clarified that the SCV system in use is the same as the commercially available one and is used in lieu of the second HF. It was further informed that:

Call setup can be variable but is usually a three stage process:

- 1) dial access number (Inmarsat or Iridium);
- 2) input PIN; and
- 3) input aircraft call number (usually done by software for security reasons) from ground to air calls, it can be anywhere between 20-50 seconds before the aircraft answers.

Satellite Data-link Operational Continuity Meeting (SOCM/1)

3.4.22 The meeting reviewed with appreciation the outcome of the first Satellite Data-link Operational Continuity Meeting (SOCM) held in Bangkok from 26 to 28 August 2009 in response to the requirements of APANPIRG Conclusion 19/24. The meeting attended by 56 participants representing stakeholders from different fields, reviewed the status of Satellite Data-link performance and provision. The meeting noted the issues identified and action items developed by the SOCM/1 meeting. The meeting also noted Satellite Communication Voice (SCV) related information and development. After reviewing the information on the Global Operational Data-link Document (GLOD), the meeting adopted following Conclusion urging the States and Aircraft Operators to provide information required for inclusion in the Appendices E and F of the Document.

Conclusion 20/31 - State and Operator aircraft information for GOLD

That,

- a) States be urged to provide Region & State Information for inclusion in the GOLD Appendix E, by sending the completed forms(s) provided in **Annex 1** to this Report on agenda item 3.4 for their flight information regions (FIRs) or control areas (CTAs) by 30 October 2009; and
- b) IATA be urged to coordinate with member airlines for providing operator & aircraft information for the GOLD Appendix F by sending completed form(s) as provided in **Annex 2** to this Report on agenda item 3.4 for each variance, clarification, or addition to applicable aircraft type by 30 October 2009.

3.4.23 To facilitate the input of data by States and users into Appendices E and F, the Airways Corporation of New Zealand has prepared an online capability for data lodgment. The GOLD page access menu should be accessed via the ISPACG CRA website at <http://www.ispacg-cra.com>, then follow the software prompts as appropriate.

3.4.24 The meeting noted various developments and information contained in the report of the SOCM/1 that had been carried out by stakeholders of the satellite communication service. The meeting was informed about the additional options that are available now. Reviewing the developments that have taken place in the recent past, the meeting was of the view that FSIT should re-convene a meeting as soon as possible, ideally in October/November 2009 and should consider additional alternative solutions to deal with the problems faced, taking into account technical and business realities. The meeting also agreed that the Second meeting of SOCM should be organized in 2010 after FANS SIT reviews the status and provides updates on consolidated improvement plans. In view of foregoing, the meeting adopted the following Conclusion:

Conclusion 20/32 – Second Satellite Data-link Operational Continuity Meeting

That, ICAO be invited to organize 2nd Satellite Data-link Operational Continuity Meeting in 2010 for stakeholders to review the developments on the performance and provision of satellite data link communication in the Asia/Pacific Region and develop a solution.

3.4.25 Appreciating the necessity of Satellite Data-link Service meeting the specified requirements for the provision of PBN, the meeting concluded that the States shall ensure availability of required level of service for the provision of ADS-C and CPDLC before they plan horizontal separation based on RNAV 10 and RNP 4. Accordingly, meeting adopted following Conclusion:

Conclusion 20/33 – Coordinate Implementation of Reduced Horizontal Separations with CSPs

That, recognizing the technical limitations in satellite data link communications capability for the provision of ADS-C and CPDLC, States intending to implement reduced horizontal separations based on RNAV 10 and RNP 4 PBN specifications in oceanic and remote area commence early coordination with Communication Service Providers (CSPs) in order to ascertain adequate data link communication/surveillance capability to support the proposed implementation. Outcomes should be recorded in a formal Service Level Agreement (SLA) between implementing States and CSPs, jointly or severally, to ensure that capabilities are available to properly support RCP 240/D specifications contained in Appendices B and C to the GOLD on an ongoing basis.

3.4.26 Recognizing that RCP 240/D specification is an enabler for the implementation of PBN based 50 NM longitude and 30/30 NM separation, the meeting recommended that the limitation in providing satellite data-link communications capability be further addressed by ICAO at a global level and hence adopted following Conclusion formulated by the SOCM/1 meeting.

Conclusion 20/34 - Technical Limitations in Satellite Data Link Communications Capability

That, recognizing current technical limitations in satellite data communications capability that impacts PBN based separation applications particularly for RNAV10 and RNP 4 in the remote and oceanic areas, ICAO be invited to address this issue at global level.

Update on MTSAT

3.4.27 Japan provided information on the Status of MTSAT and its high performance. The challenging issues identified by SOCM meeting held at end of August 2009 were highlighted and States and International Organizations were encouraged to consider using it as a redundant data-link as a near term solution.

ATS Datalink Network Plan in India

3.4.28 India provided information on their plans to implement ATS Datalink Network through ACARS to facilitate delivery of Departure Clearance, ATIS and VOLMET messages. It was informed that system for delivering D-ATIS and D-VOLMET messages through a central server installed in Mumbai and Departure Clearance systems installed in Delhi, Mumbai, Kolkata, Chennai, Bangalore and Hyderabad will be implemented by June 2010. Conceptual structure of the system was also explained.

Development of ICAO web-based aeronautical frequency management

3.4.29 The meeting noted progress in the development of a computer based programme for aeronautical VHF (air/ground) frequency assignment planning and management by the Secretariat. This programme, which would be made available to States through the ICAO web, is based on a global frequency list that comprises of the current separately managed and developed Regional frequency lists (Frequency List No.3). As a result, it was felt necessary to harmonize Regional differences between these frequency lists. Several observations were made by the Sub-group which are reflected in the report of meeting of the CNS/MET SG/13 for further consideration by the Secretariat.

Frequency assignment planning criteria

3.4.30 The meeting noted a proposal for introducing a matrix defining separation distances between different services. The meeting agreed that it would be preferred if this proposal could be reviewed on a global basis by an appropriate ICAO body, such as the Aeronautical Communications Panel. After review and approval of the planning criteria on a global level, these frequency assignment planning criteria would be considered for adoption by APANPIRG for use in the Asia/Pacific Region. It was noted that similar steps are expected to be taken in other ICAO Regions.

Frequency assignment planning criteria for VDL

3.4.31 The meeting reviewed frequency planning criteria for VDL (VDL Modes 2 and 4) that were approved by the Aeronautical Communications Panel. The meeting agreed to these planning criteria and requested the Secretariat to incorporate them into the planning criteria currently applicable to frequency list 3. These planning criteria are provided in **Appendix I** to the Report on Agenda item 3.4.

Demonstration of the VHF air ground communication frequency planning tool

3.4.32 The meeting received a detailed presentation and demonstration on the functions of the programme for VHF air-ground communications frequency planning in the frequency band 117.975 – 137 MHz.

3.4.33 The meeting was informed that a similar programme for NAV (ILS, VOR, DME, GBAS and NDB) systems is being developed. Considerations are given to include the possibility to assess potential interference from FM broadcasting stations, operating in the band below 108 MHz.

3.4.34 The meeting was of the opinion that the information on the programme and the database should not be made available on an open web-site (i.e. it should be password protected). Specific attention should be given by the secretariat to secure the integrity of the data base and to protect it from interference in particular from malicious users.

3.4.35 The meeting recorded its appreciation for the work performed on this project (as well as the project on SSR Mode S II code assignment planning) by the Secretariat and the close and productive cooperation between CNS/AIRS section ICAO headquarters and ICAO Asia/Pacific Office which assisted in improving efficiency in the coordination of frequency assignments while maintaining the central coordinating role.

Navigation

Review report of the Performance Based Navigation (PBN) Task Force

3.4.36 The meeting reviewed the outcomes of the work accomplished by the PBN TF over the course of two meetings. The work of the Task Force (TF) that was accomplished prior to the meetings of RASMAG/11 and ATM/AIS/SAR/SG/19 was coordinated with those bodies and their input was taken into consideration for the work programme of PBN TF. The Fourth meeting of the (PBN TF was held in Osaka, Japan from 4-6 March 2009 in conjunction with a successful PBN Seminar held on 2 and 3 March. The Fifth meeting of the PBN TF was held in Bangkok, Thailand from 15 to 17 July 2009 at the ICAO Asia/Pacific Office and was attended by 74 participants from 21 States and 3 International Organizations.

Asia/Pacific Flight Procedure Programme

3.4.37 The meeting noted that Flight Procedure Programme (FPP) Office for Asia/Pacific region will be located in Beijing, China. On March 26, 2009 ICAO signed a letter of intent with the CAAC regarding the establishment of the FPP Office in Beijing. ICAO State Letter T 6/13.1 1.2 - AP089/09 (FS), dated 26 June 2009, invited the States in the region to indicate their intent to participate in the Flight Procedure Programme. Initial FPP activities will include a PANS OPS initial course and a PBN Procedure Design Course to be held soon after establishment of the FPP. Both these courses are to be held at the Civil Aviation Flight University of China (CAFUC), Chengdu, China.

3.4.38 ICAO Secretariat encouraged States to participate in the Asia-Pacific Flight Procedure Programme (FPP) and urged States to take the prerequisite actions now that will prepare and enable them to make maximum use of the services of the FPP.

3.4.39 The meeting was informed that ICAO continues development of the FPP concept. The opening of FPP Office originally planned for October 2009, will be delayed for 2-3 months while various issues regarding establishment of the office are resolved.

3.4.40 Two alternatives were presented for funding the FPP. The first would calculate contributions based on the World Bank Income Category of the State and each State would be required to make a contribution taking into account their income category. The second proposal was from Australia, key elements of which are as follows:

- A core group of Asia/Pacific States would fund the entire FPP budget

- All States in the Asia/Pacific Region could then use the “free” services of the FPP as defined in the FPP Programme Document
- FPP would perform any additional services on a cost recovery basis
- The FPP Steering Committee would be composed of the funding States and would
 - Develop work plan in coordination with the FPP Manager
 - Prioritize work
 - Consider safety priorities

3.4.41 It was noted that funding of the budget under this proposal need not be restricted to States, but could include international organizations. The meeting agreed that, if the core group of States could be assembled, the way forward proposed by Australia would be preferable, as it would allow access to FPP training and services by all States in the region. Australia indicated that they would consider being part of that core group. However, if the Australian proposal should turn out to be not feasible due to lack of sufficient participating States, then the proposal to calculate contributions on the basis of World Bank Income Category would be acceptable.

3.4.42 The FPP is an outstanding opportunity for the States in the region. There are substantial contributions, in cash and in-kind, from China, the host country, the U.S.A. and Hong Kong, China and other organizations over the initial 3-year life of the FPP. The following Conclusion was adopted to encourage States to take full advantage of the resources that are being provided, to build or improve their own instrument flight procedure capability and meet the goals of Assembly Resolution A36-23.

Conclusion 20/35 – Asia-Pacific Flight Procedure Programme

That, States be encouraged to participate in the Asia-Pacific Flight Procedure Programme in order to build or improve their instrument flight procedure capabilities, meet the PBN implementation goals of Assembly Resolution A36-23 and enhance flight safety, efficiency and environmental protection.

3.4.43 The meeting noted that States should start working on the prerequisite actions to prepare for implementation of PBN in accordance with the goals of Assembly Resolution A36-23 and the Asia-Pacific Regional PBN Implementation Plan and to receive maximum benefit from the FPP. Actions that States can take include developing their State PBN Implementation Plans and start work on compliance with WGS-84 and Electronic Terrain and Obstacle Data (ETOD) requirements, using the PBN implementation plan to prioritize that work. It was also noted that many States still lack the knowledge or capability to implement the ETOD requirements and that the Annex 15 Area 2 and 3 ETOD requirement had therefore been extended to 2012. It was noted that the FPP would provide an ETOD automated storage solution, but that some States may consider this data sensitive and not be willing to allow its storage by the FPP. In response to the concern, it was clarified that States were not required to use this service of the FPP, but States would need to at least provide that data required to develop the procedures requested. The meeting was reminded that WGS-84 is essential to PBN implementation and also that despite the technical challenges, ETOD will be an essential element of the quality system of the FPP and therefore States should take action on a prioritized basis to assemble this data. Some States have already taken these measures. The States that have not taken such actions are strongly encouraged to do so. The meeting accordingly adopted the following Conclusion:

Conclusion 20/36 – Preparation for PBN Implementation

That, States that have not done so, are urged to develop their State PBN Implementation Plans, and take action in accordance with those plans to implement WGS-84 and Electronic Terrain and Obstacle Data in their States.

Review of ICAO Directives /Guidelines on APVs

3.4.44 The meeting was informed about the outcomes of the commercial study undertaken by Australia to review alternative technologies available for APV implementation. The study recommended using Baro-VNAV but at the same time noted that many aircraft were unlikely to be equipped for Baro-VNAV operations in the near future and that will make it difficult to meet the time schedule prescribed by the ICAO Assembly.

3.4.45 The meeting noted that the objective of Assembly Resolution A 36-23 on APV implementation will not be achieved in the timeframe of the resolution because many of the aircraft in the Region are not equipped to use Baro-VNAV Procedures and without other solutions available, such as augmented GNSS no APV alternatives are available. The meeting requested to bring this to the attention of the ICAO Headquarters. The meeting also noted that to address this issue, CNS/MET Sub-group had made Decision 13/7 – Feasibility of establishing a regional SBAS capability which calls for a study by the Sub-group on the need for and feasibility of establishing a regional SBAS capability.

Review of PBN Manual

3.4.46 The meeting was reminded that GPS prediction service was a necessary part of GNSS approvals to allow for the fluctuations in service availability. Concern was also raised over the United States Government Accountability Office (GAO) *Global Positioning System: Significant Challenges in Sustaining and Upgrading Widely Used Capabilities* report on GPS availability and note was taken of USAF response that GPS service would not fall below that guaranteed by the specification (SPS). This concern was further addressed in the Information Paper presented by US on the same subject. It was expressed that guidance materials are necessary to address the requirement of GNSS reporting and prediction.

Guidance Material for PBN Implementation

3.4.47 The meeting noted that many States had significant number of aircraft that are GNSS (GPS) IFR approved. Though GPS systems, in general terms support RNP 0.3 operations, the actual installations in the aircraft vary considerably, predominantly depending upon the installation antiquity. It was therefore felt necessary to have guidance for translating the GPS IFR approvals to corresponding PBN capability.

3.4.48 The meeting also agreed with the requirement for guidance material on PBN specific aspects of en-route safety assessment to facilitate implementation of PBN.

3.4.49 Following discussion on the requirements expressed for GNSS reporting and prediction, the need to assess the GPS IFR aircraft in terms of their PBN capability and for PBN-specific aspects of en-route safety assessment proposal of the PBN TF recommending development of guidance materials was endorsed by the meeting. In view of the foregoing, the meeting adopted the following Conclusion:

Conclusion 20/37 - Guidance material for PBN Implementation

That, ICAO be invited to develop guidance materials on:

- a) establishing common implementation rules and technical standards for GNSS reporting and prediction requirements;
- b) assigning PBN capability to GPS IFR aircraft in the first instance without the need for recertification; and
- c) PBN-specific aspects of en-route safety assessment.

3.4.50 To further facilitate implementation of a homogeneous PBN system in the Region, the meeting considered the PBN TF proposal to conduct a feasibility study on establishing a regional RAIM prediction system and adopted the following Decision:

Decision 20/38 - Regional RAIM prediction System

That, PBNTF be tasked to examine the feasibility of establishing a regional RAIM prediction system.

RNAV Human Factors and Systems Safety

3.4.51 The meeting was informed about Cranfield University RNAV operations safety review report highlighting a number of significant safety issues associated with RNAV operations. The report identifies a number of human factors issues that need to be considered for the conduct of RNAV operations. The meeting was of the opinion that the information provided in the report will be of immense value for the States implementing RNAV operations and hence adopted following Conclusion recommending circulation of the safety message placed in **Appendix J**. The Secretariat was also requested to facilitate to have the RNAV safety message published in the ICAO Journal.

Conclusion 20/39 - RNAV Human Factors

That, RNAV safety message provided in **Appendix J** to the Report on Agenda Item 3.4 be distributed to the States for further distribution to all operators involved in RNAV operations in order to apply the lessons learnt.

PBN Implementation Progress Report Template

3.4.52 The meeting agreed that the common template developed by PBN TF will help in harmonizing the reporting process and adopted following Conclusion.

Conclusion 20/40 - PBN Implementation Progress Report Template

That, States be urged to use the PBN Implementation Progress Report Template provided in **Appendix K** to the Report on Agenda Item 3.4 for all future reporting of their status of PBN implementation. The Report should be submitted at each of the future PBN Task Force Meeting.

PBN Implementation Plan

3.4.53 Interim Edition Version 0.3 of the Asia/Pacific Regional PBN Implementation Plan, updated by PBN TF incorporating RASMAG and ATM/AIS/SAR SG comments was presented to the meeting. The meeting, after reviewing the updated plan, adopted the following Conclusion.

Conclusion 20/41 - Asia/Pacific Regional PBN Implementation Plan

That, the Asia/Pacific Regional PBN Implementation Plan provided in **Appendix L** to the Report on Agenda Item 3.4 be adopted as Version 1.0

Asia/Pacific Regional PBN Programme Office

3.4.54 The meeting discussed a working paper from IATA, associated with the draft Conclusion formulated by the PBN Task Force (5/11) for the establishment of a Regional PBN Office or dedicated project to develop PBN based regional air routes. IATA advocated for the need for harmonized regional solutions to meet future regional demands and suggested Terms of Reference for the proposed office. IATA also brought out the need for developing regional plans to meet the predicted demand and considered the concept of a regional PBN office as a step towards a regional solution and that a roadmap will align strategies, processes, service and rules across the region. Objectives of establishing regional PBN office included linkages needed to establish PBN routes, facilitating application of uniform airspace organization, developing strategies to assist States in optimizing TMA and en-route PBN etc. While there was a growing interest for the proposal to set up a separate office, at the same time it was opposed by several States citing duplication of work and resource constraints etc. as the reasons. Japan had expressed concern on the establishment of a PBN Office or a dedicated project because the demarcation between the PBN TF and RRTF has not been clarified. After discussing the issue at length, the meeting came to a conclusion that the proposal will be taken up for consideration by the South East Asia Route Review Task Force (SEA RR/TF) established by ATM/AIS/SAR SG under its Decision 19/1. Any recommendations resulting from discussions by that Task Force will be reported to the next APANPIRG meeting through the ATM/AIS/SAR SG.

RNP AR Flight Operational Safety Assessment (FOSA)

3.4.55 Requirement of having information on PBN safety assessments was noted by the meeting. After a brief discussion on the subject, meeting agreed with the proposal of PBN TF to include presentation(s) on safety assessment as part of the agenda for the PBN Implementation Seminar to be held in Hong Kong in February 2010. The meeting also agreed with the recommendation made by PBN TF requesting ICAO to assist in addressing the PBN safety assessment training needs in the region and agreed to adopt the following Conclusion.

Conclusion 20/42 - PBN Safety Assessment Training

That, ICAO be requested to assist in addressing the PBN safety assessment training needs in the region.

RNP AR Approach Procedures

3.4.56 While discussing the issue of deciding on the implementation of RNP AR Approach procedures safety concerns were noted if States were to proceed directly to RNP AR implementation without firstly considering public RNP approaches based on the RNP APCH navigation specification. RNP AR implementation requires an assessment of the benefits and safety of the proposed operation. The meeting came to a conclusion that the States should carry out a safety and cost benefit analysis for such implementation before a decision is taken in this regard and agreed to the following Conclusion formulated by PBN TF.

Conclusion 20/43 - RNP AR Approach Implementation

That, States be urged to give detailed considerations to the operational need, safety and cost benefits prior to deciding on RNP AR Approach implementation.

3.4.57 It was also agreed that focus of the PBN Task Force should now shift from the development of the implementation plan to developing applications to facilitate achievement of mentioned gate-to-gate concept. In addition, to continue its education and training role plus identify issues to be considered by the PBN TF, the meeting adopted following Decision.

Decision 20/44 - PBN Task Force Activities

That, the PBN Task Force continues with the current TORs for two additional meetings in 2010.

Sharing of information

3.4.58 Sharing of information is considered essential for uniform and homogeneous development. Appreciating the benefits of disseminating information on the activities of various ICAO Panels and Study Groups, the meeting adopted following Conclusion.

Conclusion 20/45 - Sharing Information on ICAO Panels/SGs

That, ICAO be requested to consider sharing information on ICAO Panels and Study Groups activities/outcome regularly with regional planning/implementation groups.

3.4.59 However, this meeting did receive a brief on the work programme of ICAO Panels and Study Groups.

PBN Implementation Progress Report

3.4.60 A consolidated report on the progress of implementation of PBN in the region was provided to the meeting by the Secretariat. Progress report, presented in the tabular form contains information on the status of PBN implementation received from Australia, Bangladesh, DPR. Korea, Hong Kong China, Indonesia, Japan, Maldives, Malaysia, Nepal, Pakistan, Philippines, New Zealand, Singapore, Sri Lanka and Thailand. The meeting was informed that the following States also presented status report on PBN implementation at PBN TF/5 meeting: Thailand, China, Hong Kong China, Australia, Japan, Indonesia, Bangladesh, Republic of Korea, Pakistan and Myanmar. The consolidated report will be presented in the sixth PBN TF meeting for further review.

Linking PBN, CDO and ATC Infrastructure

3.4.61 IATA presented a paper recommending a strategy to link current efforts and infrastructure to optimize outcomes in the Terminal and Aerodrome environment. States were invited to consult with IATA and other Stakeholders about the User requirements for integration of PBN, CDO and ATFM. Linking PBN, CDO and ATC Infrastructure could be used as a short term case by case strategy to link RNAV/conventional STARS with the PBN concepts. Although, airspace designers and planners should always consider the impact to Safety, Environmental Protection, Efficiency, and Continuity, some designs are put into place to achieve terrain clearance, airspace (i.e. SUA), and other traffic flows. The meeting recognizes that maximum benefits of PBN implementation can be achieved through integrated ATM system design strategies and ATC procedures.

3.4.62 The meeting noted that CDO/OPD's can be an integral part of any new STAR whether using RNAV/RNP or conventional methodology, starting at the top of descent and terminating at the lowest point practical for the operation, whether that be a downwind point, a FAF, or DH. The meeting noted that some aircraft are not suitably equipped to carry out PBN based procedure and thus have to be processed using other means, including radar vectoring.

3.4.63 As result of discussion, the meeting was of the view that the feasibility of the four specific elements as suggested in paragraph 2.7 of IATA's paper should be further reviewed and assessed to be used as strategy by the PBN Task Force. Particular attention should be focused on the systemic implications of requiring linkages between arrival and approach, and the exclusion of ATC intervention at designated points outside the Final Approach Fix.

PBN Implementation Activities and PBN Roadmap in India

3.4.64 India provided information about the benefits that had been achieved through the implementation of PBN SIDs and STARs. It was informed that development of PBN procedures were started in 2006-07 with the primary objective of achieving effective and efficient utilization of TMA and this culminated into the implementation of RNAV Arrival and Departure procedures at international airports including Mumbai, Delhi and Ahmedabad in August 2008. The estimated fuel savings and reduction in carbon emissions after implementation of PBN procedures was noted. India also provided information on its Performance Based Navigation (PBN) Implementation Road Map. It was informed that a collaborative and coordinated approach involving all stakeholders has been adopted in the development of the roadmap, starting from initial concept stage till implementation and post implementation preview. It was informed that India has also developed in-house capabilities (procedure designing and tools) for designing PBN procedures to achieve PBN implementation targets in accordance with ICAO Asia Pacific Regional guidelines.

Time and venue of next PBN TF meeting

3.4.65 A PBN Implementation Seminar is scheduled for 1- 2 February 2010 followed by the PBN TF/6 meeting on 3-5 February 2010. Both the seminar and the meeting will be hosted by Hong Kong, China.

Review Navigation Strategy

3.4.66 The meeting reviewed the Navigation Strategy for the Asia/Pacific Region developed last year by integrating two separate strategies. Clarification on the need to transition from an interim state to the final end was discussed and it was considered appropriate to add RNP2 to the end state configurations for continental en-route. The meeting was cautioned that appropriate implementation of high performance capabilities requires training, experience and demonstration of competence for safe implementation. The meeting formulated following Conclusion taking into account above considerations.

Conclusion 20/46 - Revision of the Strategy for the Provision of Navigation Services in the Asia/Pacific Region

That, the updated Strategy for the provision of navigation services provided in **Appendix M** to the Report on Agenda Item 3.4 be adopted and published.

Other Radio Navigation Issues

Characterization of the Ionosphere

3.4.67 Australia proposed that characterisation of the ionosphere throughout Asia and Pacific Region will be a useful step in the implementation of GNSS applications including GBAS and SBAS. The meeting reviewed the effects of the ionosphere and solar activity on the performance of GNSS and agreed with the need to study archival data to establish a characterization suitable for use in aeronautical systems

3.4.68 The meeting discussed the proposal and the identified option of ICAO undertaking the characterisation of ionosphere on a global basis. It was noted that similar studies are already being conducted within States in the Asia Pacific region and in North and Central America and Europe. The value of undertaking the activity was recognised by the meeting however States were unwilling to commit to participate in the proposed task force without further consideration of the proposition. Positive bilateral discussions occurred between some States engaging in cooperative arrangements with the possibility of extending the activity to a regional activity in the future.

GPS Performance Commitment

3.4.69 United States provided information on the current status of the Global Positioning System (GPS) and its continued commitment to meet or exceed the minimum level of services specified in the 30 September 2008 Performance Standards to support PBN usage. The paper also provided information on the capabilities of the augmentation systems and new generation of GPS satellites (GPS IIF and IIIA) likely to be launched in near future. The GPS Standard Positioning Service (SPS) Performance Standard (PS), dated September 2008, includes the following commitments:

- 95% probability of 24 operational satellites (averaged over any day);
- At least 21 out of 24 orbital slots will be occupied either by a satellite broadcasting a healthy SPS Signal-In-Space in the baseline slot configuration (or by a pair of satellites each broadcasting a healthy SPS Signal-In-Space in the expanded slot configuration) with a probability no less than 98 percent (normalized annually); and
- A new commitment that at least 20 out of the 24 slots will be occupied by a satellite broadcasting a healthy SPS Signal-In-Space with a probability no less than 99.999 percent (normalized annually).

GBAS Update - USA

3.4.70 It was informed that the United States Federal Aviation Administration (FAA) is continuing to pursue research and development of GBAS technology and is supporting applicant request(s) for GBAS system design approval within the National Airspace (NAS). The FAA is in the final stages of approval for the first Category-I GBAS (Honeywell SLS-4000). This approval will allow private entities to procure and install this system for use throughout the U.S. National Airspace. Memphis International airport is the first to apply for installation and approval for use in Category-I precision approach operations. Efforts continue to focus on research, development and validation of proposed Annex 10 standards to support Category-III autoland operations. Draft standards are available to support demonstrations and development by both manufacturers and service providers.

3.4.71 FAA is continuing to support international development of GNSS augmentations and has signed Memorandums of Cooperation (MOC) with Australia, Brazil, Spain, Germany and Chile for GBAS development and implementation. The RTCA has published Minimum Operating Performance Standards (MOPS) DO253C to complement the ICAO standards and support avionics development for near term validation and GLS operations.

Seminar on Testing Of Navigation and Surveillance Facilities and Validation of Flight Procedures

3.4.72 The meeting was informed that in accordance with APANPIRG Conclusion 19/32 a ‘Seminar on Navigation and Surveillance Facilities and Validation of Flight Procedures’ was held at the Regional Office, Bangkok from 5 to 7 August 2009. It was jointly hosted by ICAO and Aeronautical Radio of Thailand (Aerothai). After reviewing the outcomes of the Seminar, the meeting adopted the following Decision recommending assessment of the need for developing guidance for inspection/validation of ADS-B ground stations.

Decision 20/47 - Guidance material for flight inspection/validation of ADS-B ground stations

That, ADS-B SITF be tasked to study the need for developing guidance material for flight inspection/validation of ADS-B ground stations.

3.4.73 The meeting also noted the discussions that had taken place in the seminar concerning issues related to the procedures for flight inspection of ground based radio navigation aids. The meeting, after reviewing the issues adopted following Conclusion inviting ICAO to develop guidance materials on critical issues related to the flight inspection procedures.

Conclusion 20/48 – Flight Inspections and Validation of Flight Procedures

That, ICAO be invited to:

- a) carry out a study for use of DGPS as a positioning reference system for flight inspection;
- b) provide guidelines for selecting GP reference point for flight inspection;
- c) review areas of possible misinterpretations in ICAO Doc 8071 such as the ones shown in **Appendix N** to the Report on Agenda Item 3.4 and provide necessary guidance on the interpretation of the ICAO requirements in order to avoid inconsistency of interpretations and to harmonize application of ICAO Standards and Recommended Practices;
- d) review information on flight validation as contained in ICAO Doc 8071 Volume II consequent to new Doc 9906 Volume V becoming applicable; and
- e) develop templates for flight validation reports for PBN IFPs including RNP APCH procedure. A sample template developed by Aerothai for RNP APCH is provided in **Appendix O** to the Report on agenda item 3.4.

3.4.74 While reviewing incidents related to flight inspection procedures and changed requirements for testing and flight inspection, the meeting agreed that the States should update their procedures and infrastructure to address safety related issues to meet the changed requirements and adopted following Conclusion:

Conclusion 20/49 - Update of procedures and infrastructure

That, the States be

- a) reminded of the contents of State Letter AN 7/5-01/52 dated 11 May 2001 on ILS maintenance procedures;
- b) reminded to provide updates to information as contained in the eighth edition of the flight inspection catalogue; and
- c) urged to consider upgrading their FIS to include the flight inspection requirements of GNSS, Interference, ADS-B, Multi-lateration etc. as necessary

Surveillance Systems

Review Report of the Eighth Meeting of ADS-B Study and Implementation Task Force

3.4.75 The meeting reviewed the outcome of ADS-B Seminar and the Eighth Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B) Study and Implementation Task Force (ADS-B SITF/8), hosted by CAAV and VANSCORP Viet Nam in Ha Noi, Viet Nam from 18 to 22 May 2009.

3.4.76 The objective of the ADS-B Seminar was to provide information to the participants on ADS-B planning and implementation and to facilitate discussions at the meeting. The Seminar covered a comprehensive list of topics on the ADS-B implementation and was well received by the participants.

Terms of Reference and Subject/Tasks List of the ADS-B Study and Implementation Task Force

3.4.77 The meeting noted that no changes to the TOR was proposed and agreed with the Subject/Tasks List updated by the ADS-B SITF and adopted the following Decision:

Decision 20/50 - Subject/Tasks List of ADS-B Study and Implementation Task Force

That, the Subject/Tasks List for ADS-B Study and Implementation Task Force provided in **Appendix P** to the Report on Agenda Item 3.4 be adopted.

3.4.78 The meeting considered it essential to develop common understanding for the regulators to publish equipage requirement for ADS-B OUT based service. The meeting supported to organize a regulators workshop on ADS-B OUT equipage requirement before May 2010 as recommended by the Task Force. Australia and USA reconfirmed to support the workshop through coordinating and providing experts including those from industry for the Workshop. Accordingly, the meeting formulated the following Conclusion:

Conclusion 20/51 - Workshop on ADS-B OUT equipage requirement

That, ICAO be invited to organize a workshop on ADS-B OUT equipage requirement before May 2010 with the assistance from Australia and USA.

Updates on ADS-B Planning and Implementation

3.4.79 The meeting reviewed implementation status updated by States at the Task Force meeting and noted some issues observed during the trials and implementation.

Australia

3.4.80 Australia provided explanation and analysis on requirements for TSO 145/6 GPS receiver that includes FDE and SA Aware capabilities and examined ADS-B NUC values for various GPS MMR and transponders. Australia encouraged other States to perform similar analysis to further confirm or refute Australian findings with respect to SA ON avionics ADS-B service reliability.

3.4.81 The meeting noted that a PC based ADS-B Filter called Foreign ADS-B Filter (FAF) is being developed by Australia to control the exchange of ADS-B data between Australia and its neighbors. The development of FAF is expected to be completed in 2009. The functional and system requirement were provided for consideration by other States who wish to share ADS-B derived data. The meeting felt that the FAF could be installed at either site or at both the sites which should be specified in the data sharing agreement. The reliability and redundancy of FAF should also be taken into account when a PC based system is used.

3.4.82 The meeting noted experience gained and lessons learnt in deploying Wide Area Multilateration in Tasmania, Australia. The project started in May 2006 and the Site Acceptance testing commenced in May 2008. A number of flight tests have been conducted as part of Site Acceptance Testing. Final flight test and conclusion of SAT is expected in 2009.

China

3.4.83 China provided the result of the Trial & Evaluation Project conducted in South Western part of China to support ADS-B implementation. Several issues including analysis of the invalid data were identified. The meeting discussed and analyzed some issues resulting from the ADS-B evaluation project including velocity and heading evaluation, low updates rate, etc. The issues and findings observed in the real flight testing were considered very useful.

Hong Kong, China

3.4.84 It was noted that Hong Kong, China plans to:

- a) mandate ADS-B carriage, by end 2013, for aircraft flying over L642/M771;
- b) mandate ADS-B carriage, by end 2014, for aircraft flying within the Hong Kong FIR; and
- c) mandate ADS-B carriage, after 2015 (TBC), for low flying aircraft, including general aviation aircraft and helicopters.

New Caledonia

3.4.85 Three ground stations were installed at the existing VHF sites in New Caledonia in March 2009. Technical testing will be conducted during October to December 2009 and operational testing will start from end of 2009 and will be completed by mid. 2010.

Pakistan

3.4.86 The meeting noted that most of the Pakistan airspace currently is already under radar surveillance, some gaps in the west, northern mountain regions and some portion in the south and southwest airspace need to be brought under positive visibility/surveillance. PCAA considers ADS-B, a potential option to fill up the gaps in radar surveillance and also considers using ADS-B to provide partial back up to the existing radar. One ADS-B station was installed at Karachi ACC on trial basis for a period of one year.

The Philippines

3.4.87 The Civil Aviation Authority of the Philippines (CAAP) installed a new Mode S SSR capable of processing ADS-B reports based on 1090ES. This enables the monitoring of ADS-B equipped aircraft in the 100NM radius from the radar station. The ADS-B function of the radar will be used to observe and evaluate population of aircrafts equipped with ADS-B within 100 NM. The CAAP has planned to install two stand alone ADS-B stations in Manila and Puerto Princesa by 2012. The CAAP also intends to include the ADS-B function in all other Mode S SSR stations that will be installed in 2012.

Viet Nam

3.4.88 Viet Nam has been participating in South East Asia's programme on ADS-B implementation and has committed to share ADS-B data with its neighboring States. Viet Nam will also consider sharing VHF communication capabilities with neighboring FIR when ADS-B control is applied. Viet Nam had preliminary discussion with stakeholders on upgrading ATM system in Ho Chi Minh AACC to process ADS-B data and sharing of ADS-B data with Singapore.

ADS-B Data Sharing

3.4.89 ADS-B data sharing between Australia and Indonesia is expected to be operational in the 2nd Quarter 2010. This phase (Phase 1A) will use single data communications infrastructure to support situational awareness and safety nets. It is proposed to use an existing satellite data communications link between Australia and Indonesia. Phase 1A, for which funding has been approved will include data sharing from existing ADS-B sites at:

- Thursday Island (installed)
- Gove (to be installed in 2009)
- Merauke (installed)
- Saumlaki (installed)

3.4.90 The meeting noted that Indonesia has offered to share its ADS-B data from Banda Aceh ground station with Malaysia during the fourth South-East Asia sub-regional ADS-B implementation working group meeting. It was noted that the ADS-B data from Banda Aceh station is expected to enhance Malaysia surveillance capability within its AOR in the Bay of Bengal Area. The meeting further noted that the current Kuala Lumpur ATCC ADS-C/Radar integrated workstation for oceanic (Bay of Bengal) Sector is capable of processing and integrating ADS-B data.

3.4.91 Indonesia confirmed that the ADS-B ground station has been installed with data format ASTERIX 21 version .23 and is ready to further discuss with Malaysia data sharing arrangements. It was encouraging to note the initiatives being taken by Malaysia and Indonesia for ADS-B data sharing in the Bay of Bengal area. States concerned were encouraged to consider sharing VHF communication capability wherever they are applicable.

FASID Tables on Surveillance Systems

3.4.92 The meeting noted that the Tables CNS 4A and 4B of the Asia and Pacific Air Navigation Plan, Volume II, FASID, Doc 9673 were reviewed and updated by the Task Force meeting. Table CNS 4 renamed as Table CNS 4A – Surveillance Systems in 2006 specifies Surveillance System requirements and Table CNS 4B renamed from the Table ATS 3 specifies ATS Automation Systems requirements. The meeting accordingly adopted the following Conclusion:

Conclusion 20/52 - Table CNS 4A and Table CNS 4B

That, the FASID Table CNS 4A and Table CNS 4B be replaced with updated Tables provided in **Appendix Q** and **Appendix R** to the Report on Agenda Item 3.4 in accordance with the established procedure.

South East Asia (SEA) ADS-B Working Group

3.4.93 The meeting noted the outcome of the fourth meeting of the South East Asia ADS-B Working group hosted by Airservices Australia in Melbourne on 9-10 February 2009. The meeting agreed with the following actions to expedite ADS-B implementation in South China Sea area:

- i) complete installation of ADS-B stations at Natuna and Matak Islands, Singapore and Con Son Island by 2010;
- ii) sharing of ADS-B data and DCPC capability between Indonesia, Singapore and Vietnam to facilitate application of radar-like separation standards;
- iii) commence ADS-B operational trials in 2010 along air routes L642 and M771; and
- iv) the earliest operational trial to be conducted approximately by the end of 2010 depending on new ATC automation system capabilities in the States. It was envisaged that an ADS-B mandate for some flight levels could come into effect in 2013.

Cost benefit study for South China Sea area

3.4.94 CANSO provided information on the outcome of a Cost Benefit Study conducted by CANSO and IATA for initial phase of ADS-B implementation over the South China Sea. The study results indicated a positive business case and highlighted operational efficiencies and savings that can be derived through the implementation. FAA was helping in the analysis, and CAA Singapore was helping with the collection of operational and technical data. The meeting appreciated the outcome of the cost benefit study.

Guidelines for Development of ADS-B Implementation plan

3.4.95 The meeting recalled the “Guidelines for development of ADS-B Implementation plan by States” adopted by APANPIRG/19 meeting under Conclusion 19/35. The meeting endorsed a proposal by Viet Nam and agreed by the Task Force to revise the guidelines with additional information and formulated the following Conclusion:

Conclusion 20/53 - Revised Guidelines for Development of ADS-B Implementation Plan by States

That, the revised guidelines for Development of ADS-B Implementation Plan by States provided in **Appendix S** to the Report on Agenda Item 3.4 be adopted.

Australian ADS-B aircraft mandate

3.4.96 Australia informed the meeting that in March 2009, the Civil Aviation Safety Authority (CASA) issued legislation for an ADS-B aircraft equipment mandate both for Australian and foreign registered aircraft for flight in the upper Australian territorial airspace (at and above FL290), with a compliance date on and from 12 December 2013. The text of the mandate is available on the following webpage: http://www.casa.gov.au/newrules/airspace/jcp/nfrm_jcp_annexb.pdf. The meeting noted additional information provided by Australia at APANPIRG/20 meeting about their plans to revise ADS-B aircraft equipage mandate to make the technical specifications for GNSS position source equipment for aircraft more explicit and extend the date for certain technical compliances (SA Aware) till 2015. These revisions are based on the outcome of various regional meetings which include ADS-B SITF and CNS/MET SG meetings. It was assured that the revision

will neither increase the cost nor impose any additional technical requirements. The meeting noted that IATA and their members have been the early supporters of ADS-B and recognized that Australia has been leading the world in many developments. IATA continues to support the intent of the Australian ADS-B mandate.

Options for states to establish Aircraft ADS-B avionics mandate

AMC20-24

3.4.97 The meeting noted the considerations of third meeting of South East Asia ADS-B WG in July 2008 on AMC20-24 published on 25 April 2008 by the European Aviation Safety Agency (EASA) which defines acceptable means of compliance for the airworthiness and operational approval of the “Enhanced Air Traffic Services in Non-Radar Areas using ADS-B Surveillance”. The working group meeting agreed that AMC20-24 with proposed changes serves as baseline document for further consideration. The AMC20-24 with proposed changes by SEA ADS-B WG is provided in the Appendix J to the Report of the ADS-B SITF/8.

ADS-B OUT Equipage Standards - IATA

3.4.98 The meeting noted a proposal for ADS-B OUT Equipage Standards proposed by IATA for the Asia/Pacific Region. It was stated that both the Australian approval method and AMC 20-24 are suitable standards for Asia Pacific. EASA AMC20-24 is better recognized as a global benchmark detailing an acceptable means of compliance for operation in non-radar areas. AMC 20-24 should eventually be adopted as the equipage standard for Asia and Pacific. Forward fit aircraft should comply from commencement of operations while retrofit aircraft must comply by 2013.

3.4.99 Regarding approval process for ADS-B OUT, IATA expressed that it should be no different for any other avionics equipment. The contracting States shall recognize as valid an air operator certificate issued by another Contracting State. Australia informed the meeting that a possible way is to endorse the list of CASA approved aircraft that can be provided on request.

Regional ADS-B Equipage Requirement

3.4.100 The meeting noted the information of options for states to establish harmonized Aircraft ADS-B avionics mandates including Australian ADS-B mandate for upper airspace from 12 December 2013, AMC20-24 published on 25 April 2008 by the European Aviation Safety Agency (EASA) which defines acceptable means of compliance for the airworthiness and operational approval of the “Enhanced Air Traffic Services in Non-Radar Areas using ADS-B Surveillance”. The meeting also noted the current state of development of the regulations in Canada and USA.

3.4.101 The meeting agreed that the Australian approval method and AMC20-24 are suitable standards for Asia/Pacific Region. However, it was also recognized that some aircraft configurations are currently unable to obtain AMC 20-24 certification without upgrade despite being in compliance with the current Australian standard. In the interim, these aircraft can and should be authorized to operate ADS-B in the Asia/Pacific Region. At the same time, the benefits of SA aware avionics and FDE were recognized and it is recommended that new aircraft should be fitted with these capabilities. Therefore, States are recommended to identify these capabilities as forward fit requirements as soon as reasonable.

3.4.102 The meeting, after considering additional comment from IATA regarding introduction of appropriate regulations to allow any of the stated requirements, adopted following two Conclusions:

Conclusion 20/54 - Regional ADS-B Equipage Requirement

That, States be urged to issue ADS-B authorizations for the interim period 2010-2020 (or until requirements can be harmonized globally) in Non-Radar Areas (NRA) airspace based on:

- AMC20-24 certification or
- Approval by CASA Australia or
- The requirements of the CASA Civil Aviation Order 20.18 Amendment (No. 1) 2009 and Advisory Circular AC21-45

Note: States that have not yet published regulations should implement necessary regulations that recognize that any one of the above requirements is acceptable and not specify an individual requirement

Conclusion 20/55 - Forward Fitment Requirements for SA Aware and FDE functionality

That, ICAO recommend States concerned to adopt forward fitment requirements which include SA aware and FDE functionality as soon as reasonable.

Sub-regional ADS-B implementation projects

3.4.103 The meeting noted the outcome of the discussion by the three ad hoc working groups established during the Task Force meeting to further develop proposals for sub-regional implementation plans for South East Asia, Bay of Bengal and South Asia and Pacific. The outcome is provided in Appendix K to the report of ADS-B SITF/8.

Note of appreciation

3.4.104 The meeting appreciated the efforts and progress made by the ADS-B SITF and the SEA ADS-B WG and expressed its appreciation and gratitude to the Civil Aviation Authority of Viet Nam and VANSORP for hosting the ADS-B Seminar and the Task Force meeting. The meeting also expressed appreciation to Airservices, Australia for hosting the fourth meeting of the SEA ADS-B Working Group.

Time and Venue of Next Meeting

3.4.105 The fifth meeting of SEA ADS-B Working Group is scheduled to be held during the end of 2009 or early 2010 in Indonesia and the next meeting of ADS-B Study and Implementation Task Force is scheduled for April/May 2010.

SSR Mode S International Identifier (II) Code

3.4.106 The meeting recalled that SSR Mode S interrogator Identifier Codes are used to reduce garble and to improve performance in the overlapping coverage of SSRs. ICAO SARPs provided for 4 bit Interrogator Identifier (II) code permits 16 code combinations to be available for operational use. In 1998, Annex 10, Volume IV was amended to provide SARPs for additional 63 Surveillance Identifier (SI) codes, in addition to II codes, to meet the requirement of SSR interrogators in the areas of high density of installations. In Asia and Pacific Regions, the density of interrogator installations does not warrant the use of SI codes and hence CNS/MET SG/12 and APANPIRG/19 agreed that only II codes be used, till such time the density increases to the extent that 16 Interrogator Identifier codes are found inadequate to provide unique codes for all the interrogators with overlapping coverage. The meeting was informed that among the 4 bit Interrogator Identifiers, code 0 (zero) is reserved and is not generically available for II code assignment.

3.4.107 The meeting reviewed a proposal on the coordination and management of SSR Mode S Interrogator Identifier codes and was informed on the progress made by ICAO to develop a tool to assist States and the Regional Offices in coordinating and maintaining a database on SSR Mode S II code assignments.

3.4.108 The meeting, noting Conclusion 19/40 of the APANPIRG, agreed to develop a Table for coordination and assignment of SSR Mode S Interrogator Identifier (II) codes to SSR Mode S stations. The Table needs to include essential characteristics of the SSR Mode S stations to enable an interference free Mode S II code assignment, such as the geographical coordinates, Designated Operational Coverage (DOC) of the Mode S station and the height above MSL.

3.4.109 The meeting agreed that, until a flexible modification procedure for Table CNS 4A (Surveillance systems) in the Air Navigation Plan (FASID) is in place, coordinated Mode S II code assignments would be maintained in a separate Table. The coordination procedure needs to secure that the ICAO Regional Office is the focal point in making Mode S II code assignments. Pre-coordination of II code assignments between neighbouring States is however encouraged.

3.4.110 The format of the Table for Mode S II code assignments is provided in **Appendix T** to the Report. The meeting stressed the coordinating role of ICAO in the Mode S II code assignments and formulated following Conclusion:

Conclusion 20/56- Coordination for SSR MODE S II Codes

That,

- a) the Table on SSR Mode S Interrogator Identifier Codes as provided in **Appendix T** on Agenda Item 3.4 to the Report be adopted; and
- b) States be advised to provide the required information as specified in the Table on SSR Mode S Interrogator Identifier Codes to the ICAO Asia/Pacific Office for coordination and registration.

Planning criteria for Mode S II code assignments.

3.4.111 Planning criteria for SSR Mode S II codes, as presented by the Secretariat, was supported by the meeting. The planning criteria, essential for developing a Regional SSR Mode S II code assignment plan, is contained in the **Appendix U** to this Report. It was noted however that this planning criteria may require future review.

3.4.112 In this connection, the meeting was presented a programme developed by the CNS/AIRS ICAO headquarters that manages and calculates Mode SS II code assignments. The meeting concurred with the functions provided in the programme. It was noted with concern that test runs of this programme have shown that in some areas of the Asia/Pacific Region not all requirements for II codes could be met with 15 codes available. The meeting agreed that in such cases, further coordination would be required noting that the SSR Mode S system offers methodologies to make a more efficient use of Mode S II codes that were assumed in the test runs. This matter requires further attention by the Asia/Pacific States. In view of the foregoing, the meeting developed the following Conclusion:

Conclusion 20/57 - Planning Criteria for SSR Mode S II Code Assignment

That, the Planning criteria for SSR Mode S II code coordination and assignment as provided in **Appendix U** to the Report on Agenda Item 3.4 be adopted as a provisional guidance material for use in the Asia/Pacific Region.

3.4.113 The meeting also requested the Secretariat to expand the planning criteria with background information on the use of II code 0 (zero).

3.4.114 The meeting could not agree to a suggestion to reserve II code 15 for airborne Mode S interrogator platforms and agreed that this matter would be considered after a full assessment of the required II codes in the Asia/Pacific Region has been completed.

SSR Mode S II Code Coordination Activities

3.4.115 Japan provided a progress report on the SSR Mode S II code coordination with neighboring States. Japan has commenced discussion and meetings to establish frameworks to solve the recognized problem. It was noted that Japan had been operating some SSR Mode S stations for a few years and has plans to replace current SSRs (Mode A/C) with SSRs Mode S. Japan had coordinated with Republic of Korea and relevant ANSP and SSR operators such as United States Air Force in Japan (USFJ and Japan Self Defense Force (JSDF). Japan also has plans to coordinate with China on the Mode S II code assignment. Coordination with military is necessary because of overlaps in coverage of civil and military SSR Mode S stations. The difficulty to get related information from military on the SSR Mode S station parameters was brought up.

Aeronautical electromagnetic spectrum utilization

3.4.116 The meeting was informed that the final draft ICAO Position on WRC-2011 Agenda Items of critical interest for Civil Aviation was circulated through a State Letter in November 2008. Comments received from Administrations in response to the State Letter were incorporated into the ICAO position which was approved by the Council in June 2009. The State Letter E 3/5-09/61 dated 30 June 2009, informing the States about ICAO Position on WRC-2011 Agenda Items of interest for Civil Aviation was also presented to the meeting. The meeting was also reminded about ICAO Assembly Resolution A36-25, through which the States and International Organizations were urged to provide full support for ICAO Position in their State and regional views for presentation to WRC-2011. The meeting after reviewing the Position presented on WRC-2011 Agenda Items urged the States for their support through the following Conclusion:

Conclusion 20/58 - ICAO Position for the World Radio Communication Conference - 2011 (WRC-11) Agenda Items

That, States be urged to:

- a) integrate ICAO Position on WRC-11 Agenda Items into their State Position presented to the regional telecommunication forum (APG) involved in the preparation of joint regional position on the Agenda Items;
- b) include ICAO Position on WRC-11 Agenda Items into the State Position to the extent possible;
- c) undertake to provide experts from their civil aviation authorities to participate in the development of State and regional positions; and
- d) ensure to the extent possible, State delegation to regional conferences, ITU Study Groups and WRC should include experts from Civil Aviation authorities.

3.4.117 The meeting was also presented the outcome of Second Meeting of the APT Conference Preparatory Group for WRC-2011 (APG 2011-2) by the Secretariat. APG 2011-2 hosted by Ministry of Industry and Information Technology of, China was held in Hangzhou China from 22 to 26 June 2009. The meeting was attended by 285 participants from 24 Member States, affiliate members including industrial organizations, international organizations and other relevant organizations. Representation of national civil aviation organizations was low at eight only. ICAO

Asia Pacific Office participated in the meeting as an observer. Agenda Items were assigned to six Working Parties, which in turn appointed Drafting Groups for developing and recording views on individual agenda items. The views developed were subsequently discussed at the level of Working Party and then in the plenary session. ICAO Position on WRC-11 Agenda Items of critical interest for civil aviation was presented through an Information Paper. Drafting Groups, while recording the preliminary views took into account ICAO Position on almost all the relevant agenda items.

3.4.118 The meeting was informed that ITU Council has rescheduled the next WRC meeting from 23 January to 17 February 2012 and this will be preceded by the Radiocommunication Assembly meeting scheduled from 16 to 20 January 2012. The APG members reported their dissatisfaction with the dates and adopted a resolution requesting APT Secretary General to write to the States requesting them to take up with ITU the reconsideration of the meeting dates.

Protection of the AMS(R)S Bands

3.4.119 Informing the meeting about its support for ICAO Position on WRC – 11 Agenda Items on critical interest to civil aviation, particularly for stable and secure access to AMS(R)S bands 1525 – 1559 MHz and 1626.5 – 1660.5 MHz over other MSSs, Japan presented the history of deployment of Multi-functional Transport Satellite (MTSAT) for providing Aeronautical Mobile Satellite Service (AMSS) over Fukoka Region. The meeting was also reminded that until 1997, frequency bands 1545 – 1555 MHz and 1646.5 – 1656.5 MHz were allocated exclusively for AMS(R) and then in WRC-97, these bands were allocated for generic allocation of MSS applications. It was stressed to recognize the importance of long-term, stable and secure spectrum access to the AMS(R)S bands in the Asia/Pacific Region. With respect to a proposed workshop on WRC related issues, the meeting noted that a Regional Preparatory Group (RPG) meeting is scheduled for 8 and 9 December 2009 in Bangkok. Japan offered their support in providing expert on WRC-11 Agenda Item 1.7 for the RPG Meeting.

Review WAFSOPSG and SADISOPSG issues

3.4.120 The meeting noted WAFS developments provided by the Secretariat of the SADISOPSG and the WAFC Provider States. Highlights include progress on the following:

- implementation of new administrative messages on corrected SIGWX
- new GRIB 2 forecasts of icing, turbulence and cumulonimbus
- “high at a glance” concatenated WAFS forecasts
- web based interface for minimum set of WAFC charts (from GRIB 2 forecasts)
- the transmission of GRIB 2 forecasts
- SADIS FTP Service
- global output performance indices of wind and temperature

Specifics of the WAFCs’ developments are provided in Appendix Y to the CNS/MET SG/13 report, which were distributed to States in the Region between the CNS/MET SG/13 and APANPIRG/20 meetings.

Review the status of implementation of SADIS and ISCS

3.4.121 The meeting was informed that the ASIA region SADIS strategic assessment tables provided by the SADIS Strategic Assessment Team for 2009-2013 were reviewed and updated to reflect the expected increase in SIGMET availability in the Region. These tables were forwarded to the SADISOPSG through the adoption of CNS/MET SG/13 Decision 13/29 in respect of future requirements.

3.4.122 The meeting recalled the replacement of ISCS-2G broadcast with ISCS-3G by the end of 2009 and that States be informed of progress of the replacement and the impact to the ISCS user States in the Asia/Pacific Region (Conclusion 19/45 refers). The meeting noted an update by the ISCS Provider State on a new ISCS-G2 cessation date of 30 June 2010 (negotiations on the extension of contract to June 2012 is underway). The implications of the cessation of ISCS-G2 to the ISCS user in obtaining WAFS products (forecasts and OPMET data) is that the user will be responsible for upgrading software and/or receiving equipment (i.e. VSAT SGS, work station) associated with retrieving WAFS products. Retrieving WAFS products via the public Internet with the development of the WAFS Internet File Server (WIFS) is expected to be available in March 2010 with unrestricted access for an interim period of time to obtain user feedback. The ISCS User Guide is expected to be updated to provide information for accessing the WIFS. The meeting noted that utilizing the public Internet for data retrieved by the WAFS for flight planning purposes only is in accordance with the *Guidelines on the use of the Public Internet for Aeronautical Applications* (Doc 9855) in that the purpose is non-time critical, which is captured in the following Decision adopted by the meeting.

Decision 20/59 – Use of the public Internet to access OPMET data and WAFS forecasts

That, OPMET data and WAFS forecasts currently distributed through the ISCS, if only used for flight planning, can be considered non-time critical and therefore, can be accessed through the public Internet.

Note: Relevant ICAO guidance will be updated accordingly, subject to consideration of a similar decision by the WAFSOPSG/5 Meeting and subsequent endorsement by ANC.

3.4.123 The meeting realized that some States, in particular the South Pacific Island States, would not be able to retrieve WAFS products in a timely manner via the public Internet. This fact posed a concern by the meeting in that the advancement of meteorological services for international aviation in the South Pacific and other Least Developed Countries may not have the Internet infrastructure available by 2010 or 2012 to retrieve WAFS products. The WAFS Provider State is considering replacing the current ISCS-G2 broadcast with ISCS-G3, which would likely require significant cost to the end user. As a result of these concerns, the meeting agreed a survey with the list of pros and cons of the public Internet (e.g. minimal cost, can utilize existing maintenance contracts, *limited access to the public Internet in some States in Pacific*) and the possible ISCS-G3 broadcast system (e.g. *significant cost to the user*, possibly greater availability to Pacific Island States) be distributed to States for consideration by the ISCS Provider State. Given the above discussion on the means of delivering WAFS products to the users under the footprint of the ISCS, the following Conclusions were adopted by the meeting.

Conclusion 20/60 – Extension of the ISCS-G2 and the implementation of the WAFS Internet file server (WIFS)

That, WAFS Washington Provider State advise the ISCS user States about its intentions to:

- a) continue to work on extending the current ISCS-G2 service through 30 June 2012 to allow users sufficient time for transition to replacement services; and
- b) provide an operational WAFS Internet File Server (WIFS) by March 2010.

Conclusion 20/61 – Replacement of ISCS-G2

That,

- a) the ICAO Regional Office, in coordination with the ISCS Provider State, prepare a survey to be circulated to the ISCS user States and focal points on their intentions as to the future reception of OPMET data and WAFS forecasts, i.e. ISCS-G3 vs. WIFS;

Note 1: the survey would include pros and cons of the two systems, together with the associated cost estimates, to be provided by the ISCS Provider State and seek information about the States' capability to assume these costs in view of establishing possible funding arrangements.

Note 2: the Secretariat request States to revalidate their respective focal point to further promote coordination between the ISCS Provider State and the user States in the Asia/Pacific Region.

- b) after completion of action under a) above by 1 December 2009, the ISCS Provider State inform the ISCS user States concerning their plans for the replacement of the ISCS-G2; and

Note 3: the ISCS Provider State is expected to indicate its future plans concerning ISCS-G3 and the WIFS

- c) the WAFSOPSG be invited to consider preparing an amendment to all ICAO regional procedures in the ANP/FASID to render WIFS and SADIS FTP Service as an alternative to the respective satellite broadcasts as the primary means of obtaining WAFS forecasts and OPMET data for flight planning purposes.

Note 4: WAFS user States are responsible for the procurement of the necessary tools to access WAFS forecasts and OPMET data provided by the WAFCs.

Note 5: The adoption of this Conclusion reinstates the APANPIRG Conclusion 19/45, Transition to ISCS 3rd Generation.

3.4.124 The meeting was informed of continued efforts to harmonize ISCS and SADIS broadcasts of OPMET data by practicing ICAO and WMO Standards in METAR identification and bulletin length.

Review the status of implementation and utilization of the WAFS products

3.4.125 The meeting was informed about further observations by Hong Kong, China on the WAFS trial gridded forecasts of icing, turbulence and cumulonimbus clouds since the CNS/MET SG/12 meeting which are reproduced in Appendix A2 to the CNS/MET SG/13 report. These observations indicated the following issues: (a) compatibility of forecasts of the two WAFCs; (b) quality issues in seasonal aspects, CB diurnal variation and CB not easily identified with tropical cyclones. Furthermore, based on the information presented at the 2009 WAFS Science Coordination Meeting, additional issues with the quality, verification and calibration WAFS trial gridded forecasts were identified and reproduced in Appendix B1 to WP/19, which notes the need for further development of in-cloud turbulence models and the re-examining of the icing, clear air turbulence and cumulonimbus verification process.

3.4.126 The meeting noted that new gridded forecasts of icing, turbulence and cumulonimbus were for experimental and development purposes only and that States would be advised not to use these products for operational purposes until 2013 or later. With that, it may be expected that a note will be provided in Annex 3 for clarity that the new gridded products would remain as trial products

and not for operational use prior 2013. It was agreed that the identified issues should be directly referred to the WAFSOPSG/5 meeting. In addition, WAFC London and Washington confirmed that efforts (further product development using biases, development of output performance indicators used for verification of new products, visualization and product modifications derived from user input planned for a workshop in September 2009) addressing the above issue were ongoing.

3.4.127 The meeting was informed of the developments of the simplified presentations, known as “high-at-a-glance” charts, of the new gridded forecasts of cumulonimbus clouds, icing and turbulence which will be presented at the WAFSOPSG/5 meeting. In order to accommodate States that would not be able to process the gridded data and provide users a simplified horizontal and vertical presentation of the new products for flight routes of concern, Hong Kong, China presented various visualization schemes for the WAFS gridded forecasts, including colour coded and monochrome charts, interpolated in time and space based on the time and route of a hypothetical flight. The meeting noted that ICAO in coordination with WMO would develop Annex 3 provisions for applicability in 2013 to enable the provision of concatenated route-specific charts for wind/temperature forecasts generated preferably from interpolating data from consecutive forecast times. The meeting also noted that the depiction of tropical cyclone and volcanic ash has not yet been addressed, but the users will be consulted on the development of the standards for visualization of the gridded forecasts.

3.4.128 In the light of the above discussions, in particular noting the significant number of WAFS developments planned in the next year, the CNS/MET SG/13 meeting updated the ASIA/PAC WAFS Implementation Plan and Procedures (Appendix A4 to the CNS/MET SG/13 report), Work Programme and composition of the WAFS/I TF (Appendix A3 to the CNS/MET SG/13 report) through the adoption of CNS/MET SG/13 Decision 13/33.

Review AMOFSG and OPMET/M TF issues

3.4.129 The meeting was informed about the highlights of the Seventh Meeting of the ASIA/PAC OPMET Management Task Force (OPMET/M TF/7) held in Bangkok, Thailand, from 2 to 4 June 2009 which are reproduced in Appendix A6 to the CNS/MET SG/13 report. The full report is available on the ICAO Asia/Pacific web site at http://www.bangkok.icao.int/meetings/2009/opmet_tf7/index.html.

3.4.130 The OPMET/M TF/7 meeting reviewed its Terms of Reference (TOR) which was last adopted by the CNS/MET SG/12 meeting (July 2008). In view of the fact that XML might be used in the exchange of OPMET contingent on a pilot project being conducted by WMO in close coordination with ICAO and endorsement by the ANC in 2010, continuous monitoring of the progress of XML would be necessary and reflected in the revised TOR and Work Programme of the OPMET/M TF (Appendix A5 to the CNS/MET SG/13 report) adopted in the CNS/MET SG/13 Decision 13/34.

Exchange of OPMET information

3.4.131 The meeting was informed of the outcome of the third RODB Coordination Meeting hosted by the Bureau of Meteorology (BoM) from 29 to 30 January 2009 in Melbourne, Australia. The tasks performed by the RODBs as a result of the RODB/3 meeting assisted in the preparation for the OPMET/M TF/7 meeting. The OPMET/M TF/7 meeting reviewed the status of Regional OPMET data banks and in particular activities such as RODB backup test, OPMET monitoring of multi-part bulletins, SIGMET, compliance with Amendment 74 to Annex 3, and a comparison of performance indices amongst three RODBs.

3.4.132 As a result of IATA monitoring OPMET data and identifying the need to properly construct METAR and TAF bulletins with regards to observation, compiling and filing times, the meeting noted a summary of steps was necessary for inclusion in the ROBEX Handbook. The summary of OPMET issuance steps located in Appendix B2 to WP/19 is in compliance with ICAO Annex 3, Appendix 10 (paragraphs 1.1 and 2.1.2), and the Asia/Pacific Air Navigation Plan (ANP).

If these steps are followed, OPMET data retrieval rates for automated systems will be improved. Given the above discussion, the meeting adopted the following Conclusion.

Conclusion 20/62 - Harmonization of procedures for OPMET data issuance

That, ICAO Regional Office be invited to

- a) Include examples of correct methods of issuing OPMET data for inclusion in the ROBEX Handbook;
- b) After completion of a) above request States in the Asia/Pacific Region to implement these methods as a matter of priority; and
- c) Consult the RODBs to monitor the progress of OPMET data issuance in compliance with the Regional Air Navigation Plan for reporting at the OPMET/M TF/8 Meeting

3.4.133 IATA also monitored OPMET data received from the Asia/Pacific Region from SADIS for the period from 10 March to 11 May 2009. METAR and TAF issued and received for AOP and non-AOP aerodromes in the SADIS Users' Guide Annex 1 dated January 2009 were analyzed. Only 61.7% and 86% of AOP aerodromes issued METAR and TAF while 66.1% and 67.7% of non-AOP aerodromes issued METAR and TAF. IATA set a goal of 95% and 90% of OPMET (METAR and TAF) availability for AOP and non-AOP aerodromes. The aerodromes that did not provide METAR and/or TAF are listed in Appendix A7 to the CNS/MET SG/13 report, which includes a summary of missing OPMET data on SADIS by State. The meeting noted that States were obliged to issue METAR, and TAF subject to RAN agreement, for AOP aerodromes unless the OPMET requirements or status of the aerodrome is changed. The CNS/MET SG/13 meeting identified that some aerodromes OPMET data appear on the ISCS, but not on the SADIS, revealing that further harmonization of the two WAFS is needed before communicating to States about missing OPMET on SADIS. With the aforementioned methods to improve the availability of OPMET data, the meeting adopted the following Conclusions.

Conclusion 20/63 — Improvement of OPMET data availability for AOP aerodromes

That, after the next round of harmonization of OPMET data between SADIS and ISCS Provider States,

- a) IATA be invited to monitor the availability of OPMET data for AOP aerodromes; and
- b) ICAO Regional Office, based on the results of the monitoring in a) above, remind States concerned of unavailability of OPMET data.

Note: the aim will be an availability of 95% of all OPMET data (METAR and TAF) from AOP aerodromes on SADIS and ISCS.

Conclusion 20/64 — Improvement of OPMET data availability for non-AOP aerodromes

That, after the next round of harmonization of OPMET data between SADIS and ISCS Provider States,

- a) IATA be invited to monitor the availability of OPMET data for non-AOP aerodromes; and

- b) ICAO Regional Office, based on the results of the monitoring in a) above, approach States concerned to confirm their agreement to continue providing OPMET data

Note: the aim will be an availability of 90% of all OPMET data (METAR and TAF) from non-AOP aerodromes on SADIS and ISCS

3.4.134 The meeting was informed that aerodrome winds are reported in degrees true as they represent an area surrounding the aerodromes and are also used for synoptic purposes which is oriented with reference to true north. Runway specific winds are reported in degrees magnetic because runways are represented magnetically. The meeting was made aware that some States do not convert METAR wind from true to magnetic for ATIS purposes. It was agreed that the responsible entity to convert METAR wind for ATIS be included in appropriate guidance material based on State replies to the proposal of Amendment 75 to Annex 3, which is expected to be in time for the applicability of Amendment 75.

Review regional requirements for OPMET information (FASID Tables)

3.4.135 IATA through continuous monitoring from 9 June to 9 July 2009 presented the CNS/MET SG/13 meeting with 1) a list of aerodromes where 2 TAF are valid at any given time, 2) a list of format errors that cause manual intervention to automated systems and 3) an example of an incorrect tropical cyclone advisory that will be addressed via a State Letter. Specifics of these observations are located in Appendix B3 to WP/19. In terms of implementation of Amendment 74 to Annex 3 with regards to one valid TAF at an aerodrome at any given time, 13% (5/38) of contracting States are noncompliant with the provision of one valid TAF at an aerodrome at any given time.

3.4.136 The meeting noted the work done by the OPMET/M TF to amend the Regional Guidance material; mainly tables for METAR and TAF exchange in the ROBEX Handbook, Appendix H to the SIGMET Guide and RODB updates to their respective appendices to the Asia/Pacific ICD. All three guidance material documents were amended in June 2009 and can be accessed at <http://www.bangkok.icao.int/edocs/>.

3.4.137 The meeting noted that FASID Tables MET 1A, 1B, 3A, 3B, 3C, 5, 6, and 7 were recently updated. An active amendment proposal (origin IATA) to FASID Table MET 1A added a 24-hour TAF requirement for seven AOP aerodromes. Furthermore, States were invited to provide updated information with regards to FASID Table MET 2A (in particular, OPMET for non-AOP aerodromes).

3.4.138 The meeting was informed of the proposal to replace FASID Tables MET 4A and 4B with the ROBEX Handbook when referencing the ROBEX Scheme in the Basic ANP as shown in **Appendix V** to the APANPIRG/20 Report on Agenda Item 3.4. This proposal is in view of current practices by RODBs and States in terms of referencing OPMET exchange information. The meeting also agreed with the subsequent proposal of removing the FASID Tables MET 4A and 4B from Part VI Meteorology (MET) – FASID as shown in **Appendix W** to the APANPIRG/20 Report on Agenda Item 3.4. With the aforementioned, the meeting adopted the following Conclusion.

Conclusion 20/65 — Replace FASID Tables MET 4A and 4B by the ROBEX Handbook

That, the FASID Tables MET 4A and 4B be replaced with the ROBEX Handbook when referencing the ROBEX Scheme in the Basic ANP and FASID in accordance to **Appendices V** and **W** to the APANPIRG/20 Report on Agenda Item 3.4. Subsequently, FASID Tables MET 4A and 4B will be removed from the FASID.

3.4.139 The meeting was informed of the proposal to replace FASID Table MET 4C with the Asia/Pacific regional OPMET data banks interface control document when referencing the responsibilities of the ASIA/PAC OPMET data banks for collection and dissemination of OPMET bulletins to support the ROBEX Scheme of the Basic ANP as shown in **Appendix V** to the APANPIRG/20 Report on Agenda Item 3.4. This proposal was in view of current practices by RODBs in terms of referencing OPMET exchange information in support to the ROBEX Scheme in the Basic ANP. The meeting also agreed with the subsequent proposal of removing the FASID Table MET 4C from Part VI Meteorology (MET) – FASID as shown in **Appendix W** to the APANPIRG/20 Report on Agenda Item 3.4. Based on the above discussion, the meeting adopted the following Conclusion.

Conclusion 20/66 — Replace FASID Table MET 4C by the Asia/Pacific regional OPMET data banks interface control document

That, the FASID Tables MET 4C be replaced with the Asia/Pacific regional OPMET data banks interface control document when referencing the responsibilities of the ASIA/PAC OPMET data banks for collection and dissemination of OPMET bulletins to support the ROBEX Scheme in the Basic ANP and FASID in accordance to **Appendices V** and **W** to the APANPIRG/20 Report on Agenda Item 3.4. Subsequently, FASID Table MET 4C will be removed from the FASID.

3.4.140 It was agreed that future CNS/MET Sub-group meetings would include a discussion on the Regional Air Navigation (RAN) Plan by examining the Basic ANP and associated FASID Tables MET. Inputs provided at the meetings could be used in formulating amendment proposals that provided regional requirements and clarity.

3.4.141 The meeting noted information on OPMET related issues such as

- Viet Nam will be compliant with the Asia/Pacific Regional Air Navigation agreement with regards to TAF issuance as of 1 September 2009 (30-hour TAF for VVTS and 24 hour TAF for VVNB, VVDN and VVPB with issuance time one hour before start period of validity)
- the assignment of the ICAO location indicator for distributing (via telecommunications gateway) TAF if different from the responsible MET office (i.e. KWBC for Pacific sites)
- available software at no cost called Aviation Forecast Prep Software (AVNFPS) that uses conditional climatology in the creation and quality management of TAF when visibility and/or ceilings are reduced (<http://www.nws.noaa.gov/mdl/pgb/AvnFPS/OB9/html/index.html>)
- TAF verification through a web based program called Stats on Demand (SOD) available to States through a web based program can assist States in focusing training needs, improvement of forecasts and quality management

Review the status of implementation of 30-h TAF and VOLMET broadcast

3.4.142 The meeting was informed of the guidance material provided by ICAO to address concerns with utilizing short TAF extracted from long TAF for use in HF VOLMET that satisfies Amendment 74 to Annex 3 (APANPIRG C19/49 refers).

3.4.143 The meeting was informed that 32% of the aerodromes required to issue 30-hour TAF had implemented the new requirements as indicated in Appendix A14 to the CNS/MET SG/13 report. The low implementation rate was due to the operational impact to the MET Services providing TAF,

ease of monitoring TAF with the same period, and some aerodromes did not contain ultra-long haul flights. IATA reminded States that some aerodromes listed in the requirements to have a 30-hour TAF were used for alternate aerodrome planning which saves airlines fuel and will continue to explain to States the need for 30-hour TAF at selected aerodromes in the RAN.

3.4.144 The meeting was informed of the CNS/MET SG/13 meeting discussion on the use of minimum/maximum temperature in 30-hour TAF. Specifically, users (flight planners and dispatch) in Hong Kong, China prefer to have two minimum temperatures in a 30-hour TAF with a maximum number of maxima/minima of three in order to keep the length of TAF to a minimum for effective operational use. IATA inclined not to limit the number of minimum and maximum temperatures that could occur in a 30-hour period and cited the importance of having the forecast temperatures to flight planning calculations needed for takeoff and landing. As not to conflict with current AMOFSG work, the meeting noted that the ANC supported the request and called upon the Secretary General to address issues in APANPIRG Conclusion 19/50, with the assistance of the AMOFSG. Regardless of the number of maximum/minimum temperatures allowed, it was concurred that for consistency the maximum number of minimum and maximum temperatures provided should be reflected in the templates of Annex 3.

Review METWSG issues

3.4.145 The meeting was informed of the METWSG issue to study the issuance of SIGMET advisories from selected regional centres. Specifically, the METWSG was making efforts to improve SIGMET compliance and consider modernization of operational needs which include the recent creation of an ad hoc group to conduct a feasibility study on the issuance of SIGMET advisory information from selected regional centre(s). With regards to implementation, the meeting noted that the establishment of the regional SIGMET advisory centre(s) would be subject to endorsement by the conjoint WMO/ICAO meeting in 2013 or 2014 and that short-term solutions such as the LOA between China and Cambodia be considered by States currently not able to provide SIGMET. This point was further expanded on by WMO in that the provision of SIGMET through an LOA would satisfy the establishment of Quality Management Systems which becomes a requirement in Amendment 75 to Annex 3 applicable in November 2010.

3.4.146 The meeting noted another METWSG issue of more accurately representing SIGMET and expanding on the current limitations in Annex 3 to accommodate the accuracy needed for optimizing flight routes around hazardous weather which significantly impacts regional airlines due to the restriction of turboprop aircraft not equipped to fly into severe icing conditions. In general, increasing the number of coordinates permissible while removing well-known geographical features when describing the SIGMET and AIRMET location is under consideration by the METWSG.

Review status of implementation of International Airways Volcano Watch (IAVW)

3.4.147 The CNS/MET SG/13 meeting agreed on updating the Asia/Pac Task Force on the Implementation of Volcanic Ash and Tropical Cyclone Advisories and SIGMET (VA/TC Implementation TF) which is provided in Appendix A15 to the CNS/MET SG/13 report. Specifically, the regular regional SIGMET tests function for this task force was changed from “conduct” to “coordinate” to better reflect the respective roles of this task force and that of OPMET/M TF. The CNS/MET SG/13 meeting also agreed to consider the expansion of tasks to include aerodrome and other meteorological warnings at the next CNS/MET SG meeting.

3.4.148 Improved ground-based monitoring and reporting of volcanic activity, in particular for low-level eruptions, and more regular reporting from volcanological authorities contributed to a record total of 1583 (326 in last report) Volcanic Ash Advisories (VAAs) issued by VAAC Darwin over the 12 months 1 July 2008 – 12 June 2009. Despite the improvements made, challenges still existed in the issuance of associated SIGMETs, NOTAMs, and AIREPs, in particular with communications. The real time challenges of volcanic ash SIGMET parallel the results of the

volcanic ash SIGMET test where 5 of 13 MWOs that did not issue test volcanic ash SIGMET were from those most vulnerable to volcanic eruptions. In addition, only one SIGMET was returned to the VAAC from the test and AFTN addressing was part of the cause. It was agreed that the lack of SIGMET test notification in some States warrants the development of a MWO contact list by the Regional Office for improving communications with these States on SIGMET tests. The meeting was informed of other improvements by VAAC Darwin as indicated in Appendix B4 to WP/19.

3.4.149 A proposal to test the cost recovery for State Volcano Observatories was presented to the meeting. Given the role of State Volcano Observatories detailed in Annex 3, paragraph 3.6 and associated resources (human, monitoring, communications and implementation of Volcano Observatory Notice for Aviation (VONA)) to meet this role, cost recovery was enabled in guidance material provided by the Handbook on International Airways Volcano Watch. Specifically, *“the State concerned, may, if it so wishes, recover reasonable costs related to the transmission of such information”*, through a Letter of Agreement (LOA) between the parties involved (CAA, MET, vulcanological agency). The enabling revision to the *Manual on Air Navigation Services Economics* (Doc 9161) in accordance to IAVWOPSG C4/9 would not be available for up to five years. Given the known economic impact of not providing timely volcanic activity information to aviation (3 million US Dollars cited by one airline associated with the Manam eruptions over a four-month period) and that many States did not have an LOA to recover costs that would help improve the infrastructure needed for timely volcanic activity reporting, there was a need to provide examples of cost recovery for State Volcano Observatories. In view of facilitating the implementation of proper monitoring and dissemination of volcanic ash, the meeting adopted the following Conclusion.

Conclusion 20/67 — Cost Recovery by Volcano Observatories

That, the ICAO CNS/MET Sub-group VA/TC Implementation Task Force, in coordination with the VAAC Provider States and the ICAO Secretariat, be invited to investigate examples of agreements between State volcanic observatories and the civil aviation authorities that may be used by other States in considering the recovery of the cost in accordance with ICAO provisions.

3.4.150 The meeting noted shared information on other volcanic ash warning systems and their impact to aviation. In particular, coordination efforts between the U.S., Japan, and the Russian Federation with relation to progress and future needs in volcanic ash monitoring and dissemination for the Kurile Islands and Kamchatka Peninsular which are detailed in Appendix B5 to WP/19. In addition, recent eruptions in the northern Pacific were discussed and the meeting noted the successful use of VONA by VAAC Anchorage and the various responses by airlines as to whether or not flights traverse through VA clouds based on airlines' and States' own assessment of risk, which are detailed in Appendix B5 to WP/19. Nevertheless, it was agreed that since the establishment of IAVW the risk of a hazardous encounter into volcanic ash has been significantly reduced since the establishment of the IAVW.

Review the status of implementation of SIGMET and warnings

3.4.151 The Rapporteur of the Task Force on the Implementation of Volcanic Ash and Tropical Cyclone advisories and warnings (VA/TC/I TF) informed the CNS/MET SG/13 meeting of the on-going activities on monitoring the issuance of VA and TC SIGMET in the ASIA/PAC States. A TC SIGMET test was conducted on 10 February and a VA SIGMET test on 17 February 2009. The meeting noted that the level of participation in these tests was improved in that the number of MWOs that were expected to issue WC and WV SIGMET increased to 77 % (27/35) and 76% (25/33) up from 54 and 65% the previous year, but still under the goal of 95%. Lastly, IATA indicated that all SIGMETs received during a short monitoring period met the format requirements and expressed appreciation on the improvements in SIGMET issuance in the Region.

3.4.152 Japan provided an expanded WV SIGMET test procedure of volcanic ash simulation exercise as detailed in Appendix A16 to the CNS/MET SG/13 report. The procedure involved a

simulated volcanic eruption that straddles three VAACs (Tokyo, Washington, and Darwin): the simulated Mt. Canlaon volcano is first identified by satellite that triggers a volcanic ash advisory by the Tokyo and Darwin VAACs and subsequent WV SIGMET by MWOs (providing there are no other advisories or severe weather in the region) which are then sent to the RODBs. Two hours after the start of the test, VAAC Tokyo and Darwin issue a test VAA for VA dissipation. The CNS/MET SG/13 meeting noted that test NOTAMs are issued 1 hour before the test and at the end of the test.

3.4.153 The meeting agreed that the expanded WV SIGMET test first be tested at a national level involving one MWO and one FIR and associated users utilizing templates that reduce the risk of the test. Once this test had been proven successful at the national level, other States would be invited to conduct a prototype test and report the findings to the OPMET/M TF and CNS/MET SG for further planning on a coordinated test amongst States possibly as early as 2011. The first of such tests would be conducted in Japan by way of the Fukuoka MWO and FIR and associated users. Consultation with VAAC Darwin on developing the test procedures was offered by Australia. Given the aforementioned, the meeting adopted the following Conclusion.

Conclusion 20/68 — Expanded WV SIGMET Test Development

That,

- a) Japan be invited to further develop an expanded WV SIGMET Test utilizing automated templates in consultation with the Darwin VAAC; and
- b) upon completion of a) above, Japan conducts the expanded WV SIGMET Test and produce an analysis to the OPMET/M TF/8 meeting for further review and subsequent reporting to the CNS/MET SG/14 meeting to determine the next phase of the test.

3.4.154 The meeting was informed of the results of the fourth regional WS SIGMET test conducted on 24 February 2009. The test results showed a decrease in State participation which was against the previous trend of gradual improvement, i.e. excluding the 9 States listed without an associated active MWO, 60% (12/20) of States participated in the WS SIGMET test. Of the twelve States that did take part, 97% of the MWOs within those States issued a test WS SIGMET. A mismatch between WMO headers used in the SIGMET test and those listed in Appendix H to the SIGMET Guide were identified, which resulted in many changes to Appendix H that was included in the June 2009 amendment to the SIGMET Guide.

3.4.155 The CNS/MET SG/13 meeting reviewed results of a comparison of the four WS SIGMET tests conducted from 2006-2009. Excluding States with non-active MWOs, the participation rate for each year was 62, 60, 70 and 60%. As indicated, the level of participation had not greatly changed in four years and remains between 60 and 70%. Focus therefore would be made to involve States who had not participated in the past tests whose FIRs were indicated in Appendix A17 to the CNS/MET SG/13 report. In addition, States with non-active MWOs were encouraged to have services be provided by a neighboring State and make progress in establishing a MWO for the provision of SIGMET. The meeting was informed that the issuance of SIGMET was expected for the Vientiane FIR by the end of 2009. The meeting also noted that the reception of SIGMET at the RODBs over the span of 4 years has significantly improved, most noted is the double reception rate at the RODB Bangkok and the greater than 90% reception rate at RODBs Tokyo, Brisbane and Singapore, the latter achieving 100% reception of test messages for 2 years in a row. The meeting noted that the next round of WC, WV and WS SIGMET tests would be conducted on 10, 17 and 24 November 2009.

3.4.156 In order to improve the participation of SIGMET tests, the following has been done or is in progress: added note to SIGMET Guide that reminds MWOs that the WS SIGMET test is not initiated by an advisory as with WC and WV SIGMET tests; develop a MWO contact list for MWOs that have not participated in any of the four tests, to encourage Fiji RODB to report the SIGMET test reception to Australia for inclusion in the report.

3.4.157 The meeting was informed of other SIGMET developments that include instructions on the use of WMO headers associated with a MWO issuing SIGMET on behalf of another MWO, improvements in SIGMET accuracy utilizing grid point value (GPV) from new techniques in numerical weather prediction (NWP), and the use of satellite products for automatic identification and categorization of deep convection. Highlights of each are provided in Appendix B6 to WP/19.

3.4.158 The meeting noted implementation issues of SIGMET for the accidental release of radioactive material into the atmosphere encountered by the United States. In order to provide transmission guidance on radioactive material that entailed the responsibilities of the sender and receiver of information was considered necessary. Existing platforms should be utilized, such as WMO Regional Specialized Meteorological Centres (RSMC) for providing forecasts of radioactive cloud using trajectory models (as with VAAC and TCAC) and disseminating the information in a standard form (as with VONA for VAAC) to designated MWO(s) for each State (as documented in FASID Tables MET 3A and 3B for roles and responsibilities for obtaining information on tropical cyclone and volcanic ash) in order to identify those responsible for the subsequent issuance of SIGMET. Clarity in Annex 3, Table A6-1 was also considered necessary for forecast position in that it currently only applied to volcanic ash and tropical cyclones, but Annex 3 section 3.4.1 g) required forecast trajectories of the radioactive cloud if known.

3.4.159 The meeting noted that at the present time the radioactive cloud information was sent by the International Atomic Energy Agency in Vienna to 1) VAAC London for further dissemination to ACCs and 2) to WMO RSMCs for further distribution to MWOs (through national meteorological centres). The notification of ACCs would be applicable in 2010. The role of MWOs was to thus issue SIGMET of radioactive cloud in a highly simplified form in order to ensure their timely dissemination. The meeting nevertheless felt that there was merit to consider developing ICAO provisions related to SIGMET on radioactive clouds. Furthermore, the issuance of Aerodrome Warnings on Tsunami was considered difficult based on the current provisions. Given the above implementation issues, the meeting adopted the following Conclusion.

Conclusion 20/69 — Implementation of SIGMET on Radioactive Clouds and Aerodrome Warnings on Tsunami

That, in view of clarifying existing Annex 3 provisions,

- a) the IAVWOPSG consider developing Annex 3 provisions and guidance material, as necessary, related to the issuance of SIGMET on radioactive clouds; and
- b) ICAO consider developing Annex 3 provisions and guidance material as necessary related to the issuance of aerodrome warnings on Tsunami.

Review METATM TF issues

3.4.160 The meeting was informed of the planned MET/ATM Task Force meeting during the 4th quarter of 2009 with dates not yet confirmed. The current Terms of Reference of the MET/ATM Task Force was updated to include the membership on the page, in which China and New Zealand were added to the membership list as noted in Appendix A18 to the CNS/MET SG/13 report. The CNS/MET SG/13 meeting also agreed that the task force considered the inclusion of other user representation such as IFALPA, IFATCA and the Airport Council International at the next meeting. The agenda of the next MET/ATM meeting would also include the nomination of a Rapporteur or chairperson of the task force. Lastly, the CNS/MET SG/13 meeting requested the ICAO Regional Office to solicit MET/ATM Task Force membership from States.

3.4.161 The meeting also noted the Air Traffic Management Flow Survey questionnaire in Appendix D to the ATM/AIS/SAR/SG/19 Report on Agenda Item 5. With regards to meteorological questions in the survey, inputs provided by the CNS/MET SG/13 meeting were incorporated in the survey (attachment F to WP/11) and adopted by the meeting in Conclusion 20/13.

MET support for operations at aerodromes and terminal areas

3.4.162 The meeting noted that the Meteorological Support Unit established in the Airservices Australia's National Operations Centre had become an integral part in collaborative decision making with all stakeholders. Specifically, tailored presentations of meteorological information to the users included regular scheduled weather briefings to Airservices, airlines and airport operators that contributed to optimizing aerodrome capacity, utilization of winds in flex tracks which saved time and fuel, using weather information in off-line analysis to improve future operations, and learning Airservices' operations which resulted in recommendations of future tailored products. IATA acknowledged the coordination efforts made between MET and ATM in Australia.

3.4.163 The meeting noted that the Air Traffic Meteorology Center (ATMetC) had been established in October 2005 for the purpose of supporting the Air Traffic Management Center (ATMC) of the Japan Civil Aviation Bureau (JCAB). The ATMetC services for the advanced Collaborative Decision Making (CDM) included: regular and extra briefings to ATMC on weather impacts to air traffic (i.e. change in approach procedures); METAR and TAF for aerodromes in adjacent countries in support to international air traffic flow management; tailored 6-hour forecasts essentially every hour that included the probability of weather impacts to air traffic flow; a summary of weather information (significant weather forecasted, numerical weather prediction, radar graphic, forecaster comments, text of impacts on air traffic, time series forecasts) every 3 hours valid for up to 6 hours. The products provided were shared through CDM amongst ATMC, ATMetC and the Ministry of Defense in order to make collaborative air traffic management decisions. As a trial, an improvement to the shared knowledge process included video conferences with ATMC, ATMetC, ATC Centers, and two Japanese airline operation control centers. The result of the conferences was an ATM Operations Plan (OP) issued by ATMC that included capacity constraints due to weather impacts, which were available to other stakeholders not mentioned. Increasing membership of CDM and holding extraordinary meetings that produced extraordinary Ops would be considered for the future. The meeting noted that the OP issued by ATMC was available to authorized users, which could be obtained upon request from the Civil Aviation Bureau.

3.4.164 The meeting noted information regarding the implementation of a post-processing software for the computation of windshear and turbulence parameters from Quick Access Recorder (QAR) data of commercial jets by the Hong Kong Observatory. The use of QAR data served two purposes: (1) to validate wind shear detection algorithms and (2) aid in the development and verification of turbulence detection algorithms, which both were derived from a suite of sensors: anemometers, weather buoys, radar wind profilers, Terminal Doppler Weather Radar (TDWR), and Light Detection and Ranging (LIDAR). The Hong Kong Observatory in collaboration with an established aerospace laboratory had developed a software package called WINDSTURB to process QAR data using different aircraft types in the calculation of the F-factor for wind shear verification and EDR for turbulence verification. Thus far, LIDAR calculations of F-factor and EDR correlated well with those derived from QAR. This gave credence to utilizing the LIDAR in producing wind shear hazard factor and turbulence products. The EDR estimation software could be utilized in detecting turbulence on aircraft. Hong Kong, China informed the CNS/MET SG/13 meeting that details of the wind shear algorithms (i.e. for the LIDAR) were available in several papers and would be provided to those interested.

3.4.165 The meeting was apprised of the latest developments with regards to aviation thunderstorm nowcasting products in support to ATM and airline users in Hong Kong, China. Developments since the CNS/MET SG/12 meeting included utilizing technology derived nowcasting techniques used for the Beijing Olympics in 2008. Specifically, technology from the Short-range Warnings of Intense Rainstorm in Localized System (SWIRLS) was tailored for aviation based on user feedback of the prototype system at Hong Kong International Airport (HKIA). In addition to the 1-hour forecast of radar reflectivity at specific altitudes within 120 km of HKIA reported last year, current and forecast elements of cloud-top heights, vertically integrated liquid water, and reflectivity were superimposed on Google Map / Geographical Information System (GIS) that included the option of displaying way-points and obtain readings of the meteorological elements described at any

particular point. A trial website had been developed for evaluation by users and was expected to become operational in mid-2010. To address storm growth and dissipation, utilizing nowcasting information with high-resolution numerical weather prediction (NWP) products might be considered. In the future, nowcasting products might be up-linked to the cockpit and adapted to specific flight routes relevant to the user.

Implementation of Amendment 75 to Annex 3

3.4.166 The meeting noted that draft Amendment 75 to Annex 3 had been circulated to States for comment due 24 April 2009. Final review by the ANC was expected in November 2009. Adoption of the Amendment 75 by the Council was expected in February or March 2010. The applicability date of Amendment 75 to Annex 3 would be 8 November 2010. Implementation issues related to Amendment 75 would be tabled for discussion at the next CNS/MET SG meeting in 2010.

Review the status of implementation of quality management system

3.4.167 The meeting noted that the provisions related to mandatory quality management system (QMS) for aeronautical meteorology would become applicable in 2010. In order to assist States in the Region to implement QMS it was considered important that WMO be invited to organize a seminar/workshop on QMS, in close coordination with ICAO. In this regard, the meeting adopted the following Conclusion.

Conclusion 20/70 — Training on QMS

That, WMO, in coordination with ICAO, be invited to organize a seminar/workshop on QMS related to aeronautical meteorological services during the first half of 2010.

Other MET issues

3.4.168 The meeting noted that the Australian Bureau of Meteorology was establishing aerodrome climatological summaries for selected aerodromes in Australia that were consistent with ICAO provisions and WMO regulations. These climatological summaries (frequency of threshold weather elements at given times of the day for a particular month were given for visibility and cloud-base height combination, visibility, cloud-base height, surface temperature range, and concurrent wind direction and speed) that will be available on the internet would assist the aviation industry in strategic and operational planning in that aerodrome forecasts and warnings were expected to improve.

3.4.169 The meeting took note of the Universal Safety Oversight Audit Programme (USOAP) conducted by ICAO in 2008 for the Aviation Meteorological Service (AMS) in Korea. Preparation for the audit between the Korea Meteorological Administration (KMA) and the Civil Aviation Safety Authority (CASA) proved fruitful based on the results and included: development of a task force team, identified and remedied MET service gaps, consultation with the ICAO Regional Office for audit details, and coordination with other units such as ATS, ACC, CASA, and SAR with particular attention to developing an agreement between CASA and KMA on the provision of MET supplied by AMS. Furthermore, KMA developed an inspectorate program, national regulations, and training records for AMS.

3.4.170 The meeting took note of the ASEAN-RoK Training Workshop on Aviation Meteorology held in Seoul, Republic of Korea from 9-15 November 2008 hosted by the Korea Meteorological Administration (KMA). Fifteen participants from ASEAN Member Countries and 3 lecturers from WMO, ICAO and New Zealand and participants from KMA attended the workshop that included lectures to improve basic knowledge of the aviation meteorological services and application of meteorological data to the operational works related to aviation meteorology.

Review of CNS/ATM Implementation and Planning Matrix

3.4.171 Secretariat presented the matrix reflecting implementation status of CNS/ATM systems in Asia/Pacific Regions. It was noted that the CNS/ATM Implementation Planning Matrix was developed in accordance with the Conclusion 11/37 of APANPIRG and the Matrix has since been updated regularly. CNS/ATM Implementation Matrix reflects the status of implementation of major CNS/ATM elements in the region which includes ATN, AIDC, CPDLC, GNSS, ADS-C and ADS-B. The meeting was informed that the Matrix was updated by the Eighth meeting of ADS-B Study and Implementation Task Force, the Fourth meeting of ATN Implementation Coordination Group and the COM Coordination Meeting.

3.4.172 The meeting further reviewed the Matrix. The updated Matrix is provided in **Appendix X** to the Report on Agenda Item 3.4.

TOR and Subject/Tasks List of CNS/MET Sub-group

3.4.173 The meeting reviewed the Terms of Reference of the Sub Group and agreed to amend it to include development of guidance materials for implementation and identification of intra-regional issues based on a proposal made by Viet Nam. The meeting also reviewed the Subject/Tasks List and included comprehensive updating of several FASID tables and feasibility study for establishing a regional SBAS capability in the Tasks List. The status of on-going tasks was also updated where necessary. The meeting considered it necessary to take into account the Performance Framework Forms being developed when the Subject/Tasks List is updated in the future. Accordingly the meeting adopted the following Decision.

Decision 20/71 - Updated Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group

That, the revised Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group provided in **Appendices Y** and **Z** to the Report be adopted.

CNS/MET Sub-Group Meeting Arrangements

3.4.174 New Zealand presented a paper proposing reduction of time spent for plenary session and extension of daily meeting time of CNS/MET Sub-Group with an ultimate objective of bringing down the meeting schedule to four days. Justification in support of the proposal was provided in terms of cost savings and reduction in Secretariat logistics requirements etc. The paper also analyzed current meeting arrangement and proposed several alternative. Issues regarding the requirement of discussing common issues like the use of AFTN, requirement of incurring additional expenditure to support extended meetings etc. were discussed in details. While agreeing to support every effort to increase the efficiency, it was concluded that this proposal to change the meeting arrangements should be deliberated in the next CNS/MET meeting first.

Record of Appreciation

3.4.175 The meeting noted that a letter of appreciation from ICAO Regional Office was sent to Cambodia and China for the cooperation for providing SIGMET service by Kunming (ZPPP) MWO for Phnom Penh (VDPP) FIR. This agreement between the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC) and the Flight Operation and Safety Department (FOSD) of Civil Aviation of Cambodia (SSCA) became effective on 1 June 2009. The meeting congratulated and recorded appreciation for the first cooperation between States in the region in meeting SIGMET requirements.

3.4.176 The meeting noted that Mr. Shun Chi-ming, Assistant Director (Aviation Weather Services) from Observatory Hong Kong, China would not be able to continue serving as the vice Chairman of the Sub-group next year due to other important commitment. The meeting recorded its appreciation and gratitude to Mr. Shun for his dedication and contributions.

3.4.177 The meeting also recorded its appreciation and gratitude for Mr. Jeffrey Bollard, Chairman of the Sub-group for his dedicated efforts and valuable contributions to the APANPIRG objectives since 1993. Mr. Bollard has been serving as chairpersons for various taskforces, working groups, and sub-groups and he has been recognized as “Dean” of Chairmen of APANPIRG contributory bodies.

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNIGC/4 Update
1	ATN Implementation Coordination	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review of implementation problems and develop co-ordinated solutions (2) Coordinate/compile the regional implementation schedule	Expedite implementation activities, ensure system compatibility through out the region	(1) Co-ordination Report (2) Waterfall schedule	(1)Ongoing/Semi-annually until (2010)- (2) Schedule 09/2009	Kapoor (India)	All members	(1)Updated the information in the ATN Router and AMHS planning tables and the implementation status.(2) Waterfall schedule relivered by September 2009
2	ATN Operational Procedures	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Development of Interim Database for Directory Services	Make available real time and quality assurance addresses for ATN message delivery	(1) Interim Database	(1) (2007)	Robert Hallman (USA)	Thailand, Hong Kong China, Japan	The database was demonstrated. Aerothai will maintain the database on behalf of the regional ICAO Office. Aerothai will serve as POC for AMC coordination between Asia/Pac States and Eurocontrol. ATN Operational Procedures is completed and forward for adoption.
				(2) Develop the operational database management procedures		(2) Operational Procedures	(2) (2007)			Completed.
3	ATN Certification & Validation Process	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop conformance procedures and checklist for AMHS and ATN routers	Expedite implementation activities, ensure global system compatibility	(1) Checklist	(1) (2007)	Sin Hie Sng (Singapore)	China, Hong Kong China, Indonesia,ROK,USA,	Completed

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNIG/4 Update
				(2) Develop validation process document		(2) Conformance Document	(2) 2007			Completed and forward to CNS/MET SG and APANPIRG/20 for review and adoption
						(3) Update to Conformance Document	(3) Ongoing until 2010			Document need to be kept up-to-date to reflect defect report from States
4	(1) ATN Documentation (2) Review all documents adopted by ATNIG and ATNTTF	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Study DIR objects/attributes proposed in ACP and follow development within other groups (2) Update document tree/establish tracking table for suspended dates (3) Standardized Report form and Guidance Material	Expedite implementation activities, ensure global system compatibility	(1) Directory Report (2) Tracking table/Updated documentation tree (3) AMC report (4) Report Form and Report Guidance	(1) Annually until (2010) (3) Periodically (4) 2010	Chonlawit B. (Thailand)	USA	Update the database.
				(2) Development AIDC documentation (including ICD) and follow development within other groups		(2) AFTN AIDC/ATN Gateway Specification ATN AIDC ICD	(2) 2008 (ACP-dependent)	(Thailand)	Thailand	Postpone development of ATN-based AIDC ICD. Awaiting new format developed by OPMET Panel
				(3) Update of AMHS ICD to comply with SARPs 3rd Edition		(3) Updated AMHS ICD	(3) (2007)		Japan	Provided to ATNIG/2 for endorsement. Adopted by APANPIRG/18. Completed

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/4 Update
5	ATN Performance	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Develop/establish/adapt/monitor/identify/analyse performance indicators	Assure QOS, service continuity, timely delivery of services	(1) AMHS performance report	(1) Annually until (2010)	Japan	Republic of Korea, India	Review and update at ATNICG WG/6
6	ATN Service Enhancements	D. Efficiency	GPI-17, GPI-19, GPI-22	(1) Review the impact of the implementation of Directory Services in the Region	Enhancing the service	(1) Report on directory	(1) Annually until (2010)	Fiji	USA, Thailand, New Zealand, Japan, Australia	Complete. AMC has been adopted by ICAO. Aerothai has been designed as POC for Asia/Pac region
				(2) Development of profiles for the directory access and exchange protocols (Ref. Decision 7/9)	Enhancing the operation	(2) Report on profiles	(2) (2011)	Fiji		
				(3a) Study IPv4 vs. IPv6 implementation, operational and transition impacts (3b) Investigation 9880 standard	Inbter-regional network compatibility	(3) Report (4) Report	(3) 2011 (4) 2009/2010 (WG/6 and ATNICG/5)	Singapore	Australia, China, India, Fiji, HongKong, China, Japan, and USA	(4) USA will draft report
				(4) Study for transition to BUFR code	Enhancing the service	(4) Report on the impact of BUFR code to ATN	(4) (2007)	Japan	New Zealand, USA,	Closed. BUFR code is no longer considered. Awaiting OPMET Panel for Meteorological message format.

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/4 Update
				(5) Study for transition of AFTN-based AIDC as an alternative to ATN based AIDC to ATN environment	Improving the service and lowering the operating cost	(5) Report on the impact of transition of AFTN-AIDC to ATN-AIDC AFTN AIDC/ATN Gateway Specification	(5) (2008)	Thailand	India, Indonesia, New Zealand, USA,	A Draft specification of AFTN AIDC/ATN Gateway was presented.
		D. Efficiency	GPI-17, GPI-19, GPI-22	Analyze Common Address Prefix Proposal	Improving the service and routing efficiency	Report on common prefix based analysis conducted	End of 2008	Mark Brown (Japan)	Australia, Fiji, HongKong China, New Zealand and USA	Action Items developed at ATNICG/2 for follow-up at WG meetings.
7	Security	B. Security	GPI-17, GPI-19, GPI-22	(1) Develop ATN System Security policy	Safe and Secure Inter and Intra Regional Communication and service infrastructure	(1) Policy Document	(1) Annually until (2010)	Vidyut Patel (USA)	Australia, Hong Kong China	Adopted by APANPIRG/19
				(2) Develop ATN System Security Guidance		(2) Guidance Document	(2) (2008)			On-Going review and update
				(3) Develop ATN System Security Solution for Initial and Enhanced Services		(3) Security, Technical, Management and Operational Control	(3) (2008)			On-Going review and update

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/4 Update
				(4) Co-ordinate and monitor ACP working group and other regions including Directory Service, PDRs		(4) Report	(4) Semi-Annually until (2010)		Thailand	On-Going review and update
				(5) Develop ATN System Security Check List based on Security Control and Regional Incident Response Plan and Contingency Plan		(5) Check List, Regional Incident Response Plan and Contingency Plan	(5) (2009)			Forward to CNS.MET SG and APANPIRG for review and adoption
8	ATN Service Enhancements (supporting amended ICAO Flight Plan and ATS Message Formats)	D - Efficiency	GPI - 17, GPI - 19, GPI - 22	1) Review the impact of the implementation of Amendment 1 to 15th Edition of Doc. 4444 effective 15 Nov. 2012 (PANS ATM Chapter 4 and Appendix 3 relating to the ICAO Flight Plan and associated ATS Message formats to the AFS	Enhancing the service	1) Report on capability of existing and planned AFS systems to the revised ICAO Flight Plan and ATS Message Format	1) Annually until 2011	USA	Fiji India Hong Kong New Zealand Singapore USA	Pending result from ICAO Flight Plan and ATS Message TF
				2) Identify the new requirements for AMHS/AFTN to support new message format	Enhancing the operation	2) Report on impact of New ATS message format in AMHS	2) 2010	Thailand	Fiji India Hong Kong New Zealand Singapore USA	On-going task-Report at ATNICG/4
				3) Identify the link control procedure using the AMHS to support the revised ATS message format to the ATC automation system	Enhancing the service	3) Report whether special link control procedure is required	3) 2010	Thailand	Fiji India Hong Kong New Zealand Singapore USA	On-going task

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/4 Update
	The ATN PERFORMANCE OBJECTIVE The APAC ATN ground-to-ground infrastructure will be fully operational 53 percent at 23 locations by December 2007. (GPI-22) COMMUNICATION NETWORK INFRASTRUCTURE Related ATM objectives: AMSS; HF data; VHF data; SSR Mode S; ATN Scope: To evolve the aeronautical mobile and fixed communication infrastructure, supporting both voice and data communications, accommodating new functions as well as providing the adequate capacity and quality of service to support ATM requirements. (GPI-19) METEOROLOGICAL SYSTEMS Objective: To improve the availability of meteorological information in support of a seamless global ATM system. (GPI-17) IMPLEMENTATION OF DATA LINK APPLICATIONS Scope: Increase the use of data link applications Related ATM objectives: Application of data link; Functional integration of ground systems; with airborne systems; ATS inter-facility data communication (AIDC)									

APANPIRG/20
Appendix A to the Report on Agenda Item 3.4

No.	PERFORMANCE OBJECTIVE	ICAO Strategic Objective	Associated GPI	Tasks/Strategy	Benefits	Deliverables	Target Date	Leader	Supporting Members	ATNICG/4 Update



**Asia /Pacific
ATN IDRP Routing Policy
Version 3.1**

SUMMARY

This paper is the version 3.1 of the ATN IDRP Routing Policy for the Asia and Pacific region. It maintains the approach developed at the ATNICG/2 meeting in Hong Kong in May 2007. This document however defines a combined ASIA/PAC regional prefix rather than a combined ASIA/PAC/NAM region.

September 2009

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4.1.3 Route Distribution Policies for Routes to Airborne Systems 20Executive Summary

This document provides global policy for Aeronautical Telecommunication Network (ATN) routers operating in the Asia and Pacific Region in support of Air Traffic Services Message Handling Services (ATSMHS) and other ATN services.

Background

The ATN Transition Task Force (ATNTTF) has been assigned a number of tasks to prepare the region for the introduction of the ATN. At the third meeting of the ATNTTF Working Group B meeting held in Bangkok, Thailand on 27 through 30 August 2001, a specific action item was identified to develop documentation on Routing Policy. This document is in response to that action.

Overview

This document presents relevant background information on routing and provides a general discussion of policy-based routing. With this background, policy for routing to ground systems is specified for ATN ground-ground routers in support of inter-regional, intra-regional and local connectivity. This document additionally provides a set of recommended policies for routing to airborne systems. These policies are subject to further development in future versions of this document as the Asia/Pacific ATN Routing architecture evolves to include air-ground routers.

1. INTRODUCTION

The Aeronautical Telecommunication Network Transition Task Force is preparing a series of documents which will govern the introduction of the ATN into the Asia and Pacific region. This document is to be the basis of ATN routing policy for the region.

1.1 OBJECTIVES

The objective of this document is to specify global policy for Aeronautical Telecommunication Network (ATN) routers operating in the Asia and Pacific Region in support of Traffic Service Communications (ATSC) and Aeronautical Industry Service Communications (AINSC).

1.2 SCOPE

The scope of the document includes:

- An introduction to relevant routing concepts;
- An overview of the Inter-domain Routing Protocol (IDRP) and the rational for its use in the ATN
- Routing policy requirements for ATN routers in the Asia and Pacific Region.

1.3 REFERENCES

Reference 1 Manual of Technical Provisions for the ATN (ICAO Doc 9705-AN/956)

Reference 2 Asia/Pacific ATN Routing Architecture

Reference 3 ISO/IEC TR 9575, Information technology – Telecommunications and information exchange between systems – OSI Routeing Framework

Reference 4 ISO/IEC 10747, Information technology – Telecommunications and information exchange between systems – Protocol for Exchange of Inter-domain routeing Information among Intermediate Systems to Support Forwarding of ISO 8473 PDUs.

Reference 5 Asia/Pacific ATN Addressing Plan

1.4 TERMS USED

Backbone Router – A backbone router (in the Asia and Pacific region) is a Class 4 Ground/Ground ATN router which has been designated by the operating state/organization to provide an appropriate level of performance and support the routing policies for inter-regional and intra-regional connectivity, and whose operation as a backbone router has been approved by the ICAO regional office as agreed-to by all other member states/organizations.

Network Addressing Domain – A subset of the global addressing domain consisting of all the NSAP addresses allocated by one or more addressing authorities.

Network Entity (NE) – A functional portion of an internetwork router or host computer that is responsible for the operation of internetwork data transfer, routing information exchange and network layer management protocols.

Network Entity Title (NET) – The global address of a network entity.

Network Service Access Point (NSAP) – Point within the ISO protocol architecture at which global end users may be uniquely addressed on an end-to-end basis.

Network Service Access Point (NSAP) Address – A hierarchically organized global address, supporting international, geographical and telephony-oriented formats by way of an address format identifier located within the protocol header. Although the top level of the NSAP address hierarchy is internationally administered by ISO, subordinate address domains are administered by appropriate local organizations.

NSAP Address Prefix – A portion of the NSAP Address used to identify groups of systems that reside in a given routing domain or confederation. An NSAP prefix may have a length that is either smaller than or the same size as the base NSAP Address.

Routing Domain (RD) – A set of End Systems and Intermediate Systems that operate the same routing policy and that are wholly contained within a single administrative domain.

Routing Domain Confederation (RDC) – A set of routing domains and/or routing domain confederations that have agreed to join together. The formation of a routing domain confederation is done by private arrangement between its members without any need for global coordination.

1.4 ROUTING CONCEPTS

In this document the primary concern is routing through the ATN at the network layer. In order to establish a common framework, certain fundamental concepts are described. See Reference 3 for more detailed information.

The routing process in any network involves a forwarding function and a route maintenance function. Forwarding refers to those actions which result in the actual relaying of network protocol data units (NPDUs) through nodes in the network. From a simplified perspective, forwarding is the process of accepting an incoming NPDU, accessing a routing database to determine the next network node or locally attached system, and sending the NPDU on to that node or system. Route maintenance refers to the update of the routing database. Route maintenance may be static, in which case it is performed through management operations in either an on-line or off-line mode, or it may be dynamic (also known as adaptive routing). Dynamic route maintenance involves the exchange of routing protocol data units (RPDUs). RPDUs may be received from a single source such as a Network Control Center, in which case routing is said to be centralized. Alternatively, RPDUs may be exchanged among the nodes in a network, in which case routing is said to be distributed. See Figure 2-1. In the ATN a distributed adaptive routing procedure is adopted.

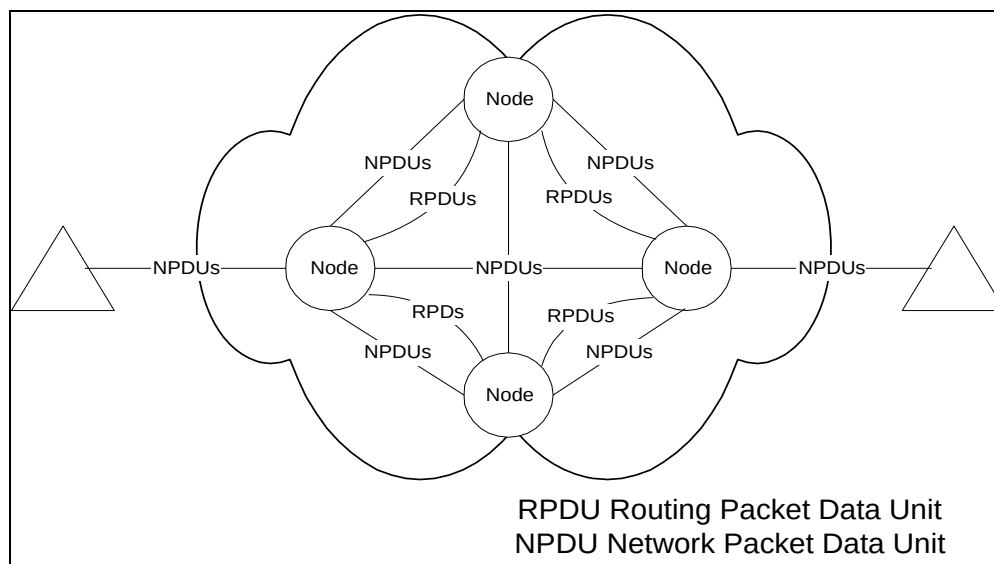


Figure 2-1. Exchange of NPDUs and RPDUs in Generic Network Environment

The route maintenance and forwarding functions under a distributed adaptive routing procedure are depicted generically in Figure 2-2. The routing database is partitioned into a Routing Information Base (RIB), which is the primary concern of the Route Maintenance Function, and a Forwarding Information Base (FIB), which is the primary concern of the Forwarding Function. The Route Maintenance and Forwarding Functions are conceptually connected through a Decision Process. The Decision Process determines:

1. Which routes are accepted into the Routing Information Base,
2. Which routes are placed into the Forwarding Information Base in support of the forwarding function, and
3. Which routes are to be advertised to other nodes in the network.

As will be described in more detail below, the decision process is affected by policy.

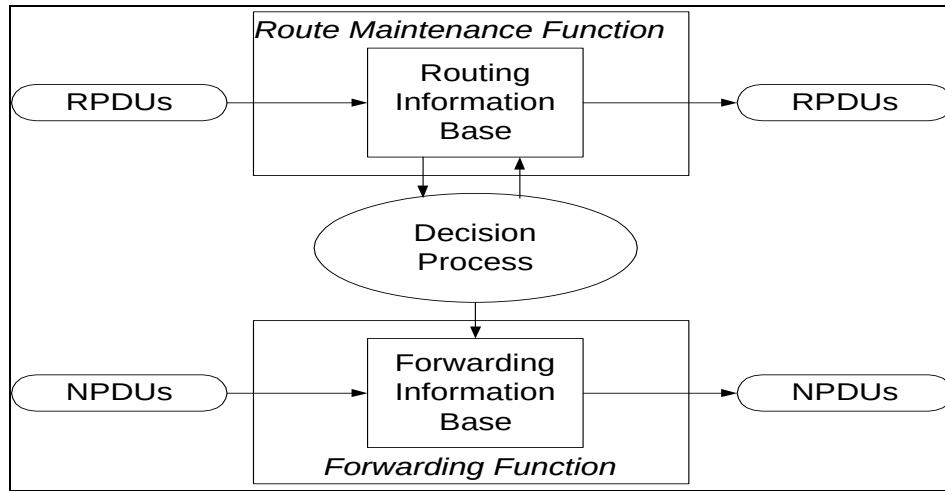


Figure 2-2 Generic Routing Functions

1.5 INTER-DOMAIN ROUTING PROTOCOL (IDRP)

In this section the rationale for the use of IDRP in the ATN is summarized. The three general reasons for using IDRP are support for mobility, support for policy-based routing, and support for the secure exchange of routing information.

1.5.1 SUPPORT FOR MOBILITY

A fundamental objective of the ATN is to maintain connectivity from ground-based ATSC and AINSC end systems to their airborne counterparts. This is to be accomplished over multiple subnetworks; that is, over the various VHF Digital Links, over Mode S and over AMSS (Aeronautical Mobile Satellite Service). This objective is essentially a routing problem. If we consider the general approaches to routing, it is immediately obvious that static routing would not work. This is because routes to an aircraft are inherently dynamic; that is, aircraft traverse multiple subnetworks and within each subnetwork they traverse multiple ground stations. Thus we are left with some type of adaptive routing. A centralized approach to adaptive routing has the problem that the central control center where changes would be reported becomes a bottleneck, especially in a global environment. Even if enough capacity could be provided, there are associated timing considerations; that is, a reported change in an aircraft's location must be available to communicating ground systems in real time. There are also administrative considerations with centralized adaptive routing. These considerations include determining which administration (a particular Civil Aviation Authority (CAA), service provider, etc.) would operate the central control center and what the liabilities associated with such an operation would be. Accordingly, since neither static routing nor centralized adaptive routing would be appropriate, we are led to some type of distributed adaptive routing approach as the solution to mobility.

There are two general approaches to distributed adaptive routing. The first is called *link state* routing and the second is called *distance vector* routing. Under link state routing, each change in the network topology (in connectivity to an aircraft in the context of support for mobility) is broadcast to every other node in the network. Upon receipt of each change message, each node updates its image of the network topology and calculates the complete (shortest) path to the destination in the change message. The main problem with this approach is that the number of messages required to report changes in network topology becomes quite large in a global environment. Thus we arrive at a distance vector approach to distributed adaptive routing approach in the ATN. Under distance vector routing, a change in connectivity is propagated (i.e., advertised) to affected ATN routers throughout the network. The RPDU consists of a vector containing a destination prefix and a distance metric, which is generically a measure of the cost associated with the path being advertised to a particular destination.¹ The difference

¹ In the context of the OSI Routing Framework (Reference 3) IDRP would be classified as a distance vector routing protocol. However, in the technical literature, IDRP is often called *path vector* routing protocol. This is because IDRP can advertise multiple metrics called path attributes associated with a

however (from link state routing) is that not all routers need be affected. In other words, not every router needs to know about every change. Particular changes need only be propagated to a point where a choice of routes is to be made. Beyond that point either an aggregate route may be advertised to other routers or these routers may be configured with a default path to that point. For example, a service provider with a ground-ground router connected to a CAA's ATN router on one side and with connections to multiple service provider air-ground routers on the other side may not need to advertise a new route each time an aircraft connects to a new air-ground router. The service provider ground-ground router may rather only advertise an aggregate route to the ATN router when the aircraft connects with the first air-ground router and withdraw the aggregate route when the aircraft is no longer connected to any air-ground router. At the same time, non-backbone routers belonging to the CAA need not receive routes to individual aircraft but rather may be configured to forward all aircraft NPDUs to the backbone router.

1.5.2 SUPPORT FOR POLICY-BASED ROUTING

1.5.2.1 IDRP Model of Operation

ATN routers execute a particular distributed adaptive routing protocol for route maintenance. The protocol is called IDRP, which stands for Inter-domain Routing Protocol (Reference 4). Figure 2-3 depicts a simplified model of IDRP route maintenance and CLNP forwarding.²

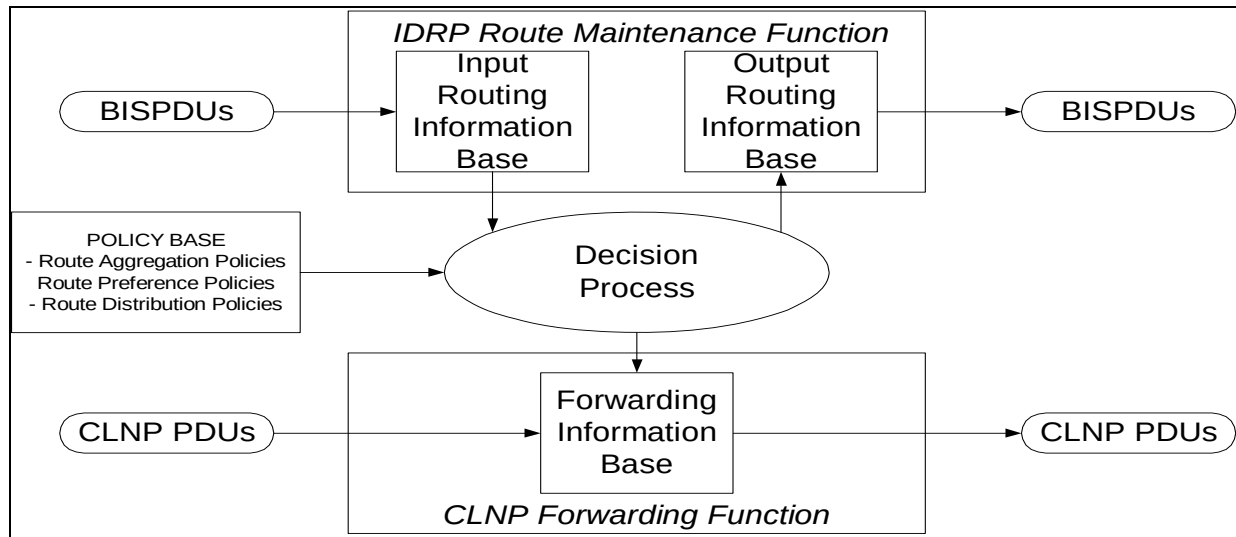


Figure 2-3. IDRP Route Maintenance and CLNP Forwarding

particular route to a destination rather than a single distance metric.

² The model of routing components in this document is a simplified form of the IDRP model. The IDRP specification (Reference 4) contains a more detailed model involving the concept of a multiple local RIBs for combinations of path attributes.

In the context of IDRP, an ATN router is a Boundary Intermediate System (BIS), and accordingly the routing PDUs exchanged are called BISPDUs. Similarly, in the context of CLNP (Connectionless Network Protocol: the network protocol used by ATN), the forwarded NPDUs are called CLNP PDUs. As depicted in the figure and described in the following section, the IDRP decision process is conditioned by a policy base.

1.5.2.2 Types of Policy

The IDRP decision process (and thus ATN routing policy) is conditioned by three types of policy concerns.

- *Route Aggregation* policies permit ATN routers to reduce the amount of routing information propagated throughout the ATN.
- *Route Preference* policies determine which routes received in BISPDUs will be installed in the Forwarding Information Base. Route preference policies thus determine which path an ATN router will select to forward CLNP NPDUs on.
- *Route Distribution* policies determine which routes an ATN router will advertise to other ATN routers. Route distribution policies are a key aspect of a domain's transit policy in that they determine which routes will be permitted in a domain. An ATN router will not propagate a route, which it does not wish to support. By selective advertisement of routing information ATN routers control the use of their own resources since other routers cannot choose a route they do not know about.

1.5.3 SUPPORT FOR SECURE EXCHANGE OF ROUTING INFORMATION

A final general advantage of using IDRP in the ATN is that it has a mechanism for the secure exchange of routing information. The mechanism takes advantage of a transport protocol built in to IDRP operation. When an IDRP connection is established (through the exchange of OPEN BISPDUs), the type of security to be applied to subsequent BISPDUs is signaled. In Edition 3 of ICAO Doc. 9705, procedures for performing *Type 2* authentication are specified. With type 2 authentication each ATN router can be assured that the routing updates it receives are from a peer ATN router whose identity has been confirmed using strong (cryptographic) authentication.

2. GENERAL FRAMEWORK FOR ATN IDRP ROUTING POLICY

2.1 ROUTING POLICY GOAL FOR ATN ROUTERS

The ATN infrastructure and each region of the infrastructure must support a consistent set of routing policies to provide paths to ground systems at an inter-regional, intra-regional and local level and paths to airborne systems without an inordinate number of routing protocol updates. Accordingly, the detailed policy requirements and recommendations specified in section 4 are derived from the following general routing policy goal:

- a. Asia and Pacific region ATN routers will provide global shortest path connectivity with a minimal exchange of routing information.**

This general policy goal is intended to meet the objective of minimizing the delay to PDUs traversing the network while ensuring that the exchange of routing information does not significantly degrade the performance of the network for delivery of PDUs.

2.2 NETWORK ORGANIZATION FOR ROUTING TO GROUND SYSTEMS

For ground ATSC and AINSC applications the ATN infrastructure may be partitioned into various levels of organization. See Figure 2-1, which depicts routing domains for three states in the Asia/Pacific region.. Routing domains at the highest level are associated with a particular ICAO region or a group of regions called a “combined region”. The Asia/Pacific region is a combined region with an NSAP prefix of 4700278191. Within a region, routing domains are next associated with a particular state or organization. Figure 2-1 depicts three arbitrary states (s1, s2, and s3). Note that in accordance with the regional addressing plan s1, s2, and s3 would actually be a two-byte field with the two ASCII characters assigned to the state or organization. Finally, within a particular state or organization there may be multiple local routing domains. Figure 2-1 depicts one routing domain in states s1 and s2 and three routing domains in state s2. Within this framework ATN ground routers may be characterized and their policy requirements specified according to the type of connectivity they have to adjacent ATN ground routers.

- ATN routers connecting to adjacent routers in another region are said to have “inter-regional” connectivity.
- ATN routers connecting to adjacent routers in another state or organization within a particular region are said to have “intra-regional” connectivity.
- ATN routers connecting to adjacent routers within a particular state or organization are said to have “local” connectivity, i.e. intra-state or intra-organizational connectivity.

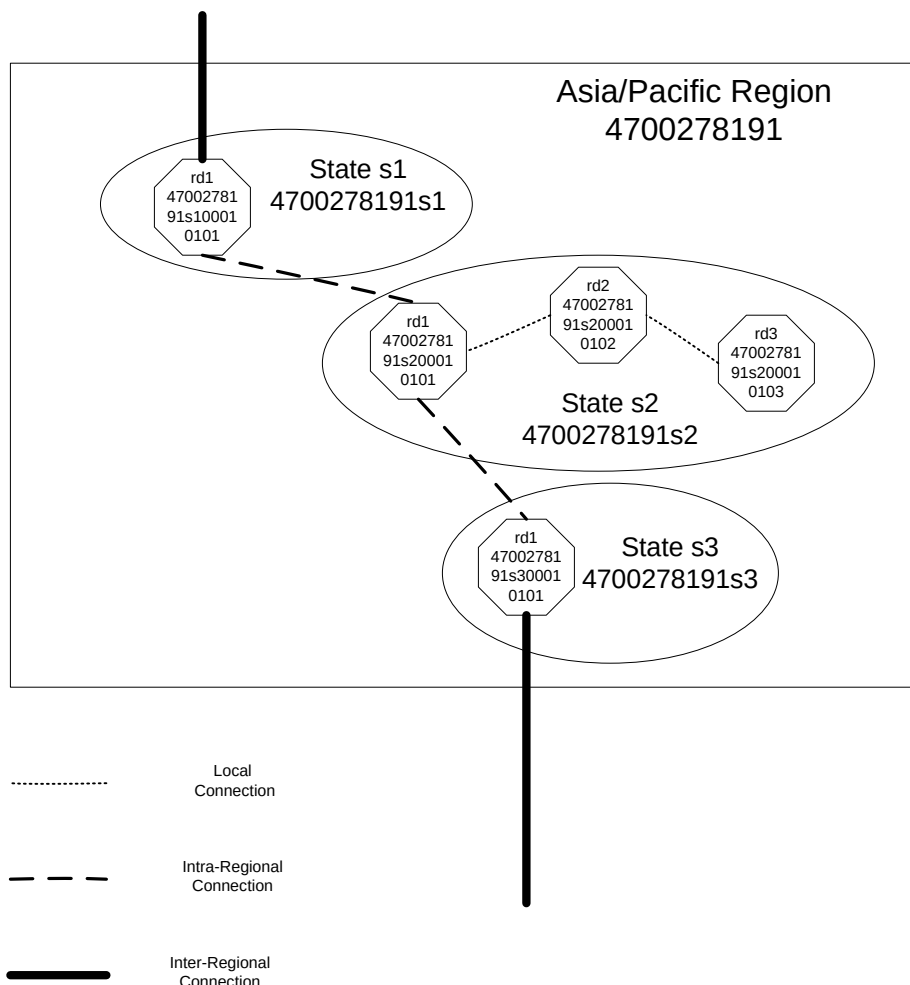


Figure 2-1. Connectivity of Ground Routing Domains

2.3 NETWORK ORGANIZATION FOR ROUTING TO AIRBORNE SYSTEMS

For air-ground ATSC and AINSC applications in the ATN it is useful to distinguish ground state domains from air-ground domains or subnetworks, which may operated by Service Provider organizations. See Figure 2-2. This figure depicts two distinct Air-Ground subnetworks, which are connected to the regional backbone. Note that a state may operate its own Air-Ground subnetwork, in which case the concepts that apply to Service Providers apply to the state-operated subnetwork.

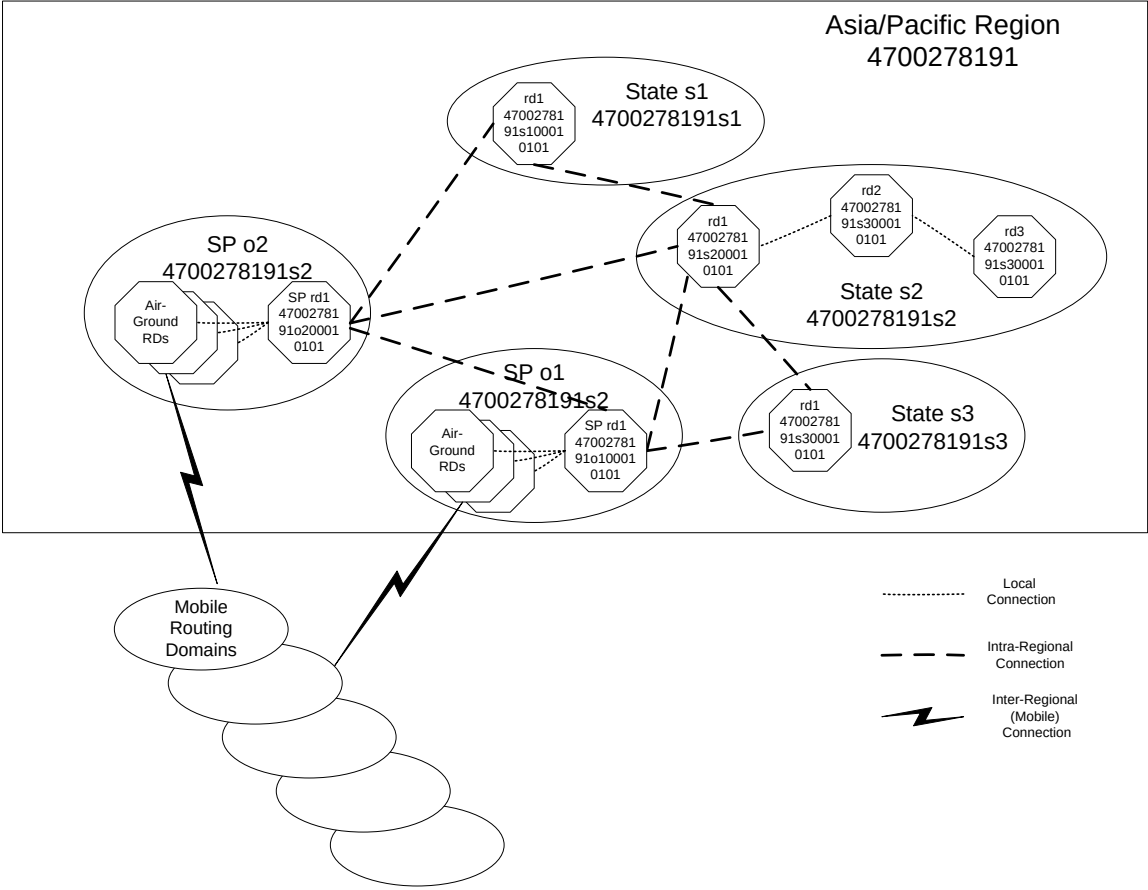


Figure 2-2. Connectivity of Air-Ground Service Providers to Regional Backbone

3. POLICY FOR ROUTES TO GROUND SYSTEMS

The policy requirements for ATN routers in the Asia and Pacific region for routes to ground (i.e., fixed) systems are specified in this section 3. Section 3.1 specifies the general policy for routes to ground systems. Policy requirements are next partitioned into policy for inter-regional routes (section 3.2), policy for intra-regional routes (section 3.3), and policy for local routes (section 3.4) according to the organizational framework described in section 2.2. Within these second-level sections policy requirements are partitioned at a third level according to the types of policy concerns identified in section 1.5.2, that is, policy requirements are partitioned at a third level into aggregation policies, preference policies, and distribution policies. Section 3.5 notes that additional state/organizational local routing policies are permitted.

Note 1. – This section specifies routing policy requirements for backbone routers in the Asia/Pacific region. A backbone router is a Class 4 Ground/Ground ATN router which has been designated by the operating state/organization to provide an appropriate level of performance and support the routing policies for inter-regional and intra-regional connectivity, and whose operation as a backbone router has been approved by the ICAO regional office as agreed-to by all other member states/organizations. This section also contains a number of recommended policies non-backbone routers.

Note 2. – This document and companion documents specify requirements for ATN routers in the “Asia and Pacific region”; however, in order to facilitate shortest path routing across inter-domain boundaries, the Asia and Pacific regions are combined under a single region identifier. See Appendix B for more information on the combined “Asia/Pac region”.

3.1 GENERAL POLICY

- a) If a backbone router receives multiple routes to an aggregate or specific destination, the route with the shortest path (i.e., lowest value of RD Hop Count) shall be selected.
- b) All ATN routers in the Asia and Pacific shall authenticate the identity of peer ATN routers.

Note. – Authentication may be accomplished via IDRP Type 2 Authentication as specified in Edition 3 of ICAO Doc 9705 or via local means via Bilateral Agreement between the responsible organizations.

3.2 POLICY FOR INTER-REGIONAL AGGREGATE ROUTES TO GROUND SYSTEMS

Inter-regional route aggregation permits advertisement of a single aggregate route which identifies all systems in an ICAO region. Aggregation at an inter-regional level refers to aggregating NLRI fields to an NSAP prefix up through the first octet of the ADM field. (Reference 5)

Note. – Although this section specifies policy for inter-regional aggregate routes, the strategy for the Asia and Pacific regions is to combine them under a single region identifier. Therefore, the policy specified in this section will not apply between the Asia and Pacific regions See Appendix B for more information on the combined “Asia/Pac region”. Although the Asia/Pac strategy will result in not advertising inter-regional routes among these regions, this inter-regional policy is still specified since the actual interface to other regions has not yet been determined.

3.2.1 ROUTE AGGREGATION POLICIES FOR INTER-REGIONAL ROUTES

- a) Backbone routers with inter-regional connectivity shall be configured with aggregate routes to ground systems for ATSC and AINSC applications at an inter-regional level.

3.2.2 ROUTE PREFERENCE POLICIES FOR INTER-REGIONAL AGGREGATE ROUTES

- a) Backbone routers with inter-regional connectivity shall accept inter-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.
- b) **Recommendation.** - Backbone routers with inter-regional connectivity should only accept inter-regional aggregate routes on these connections.

Note 1. - A simple method is to not accept routes with an NSAP prefix longer than the first octet of the ADM field. An alternative is to only accept inter-regional aggregate routes which have been pre-configured (using a so-called access control list).

Note 2. – This policy statement is a recommendation since in the future other routes such as routes to an airline’s “administrative” routing domain may need to be supported.

- c) Backbone routers with intra-regional connectivity shall accept inter-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.
- d) Routers with local connectivity (i.e., intra-state or intra-organization) shall accept inter-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

3.2.3 ROUTE DISTRIBUTION POLICIES FOR INTER-REGIONAL AGGREGATE ROUTES

- a) Backbone routers with inter-regional connectivity shall distribute inter-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.
- b) Backbone routers with intra-regional connectivity shall distribute inter-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.
- c) Routers with local connectivity shall distribute inter-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

3.3 POLICY FOR INTRA-REGIONAL AGGREGATE ROUTES TO GROUND SYSTEMS

Intra-regional route aggregation permits advertisement of a single aggregate route which identifies all systems in a particular state or organization of an ICAO region. Aggregation at an intra-regional level refers to aggregating NLRI fields to an NSAP prefix up through the complete ADM field. (Reference 5)

3.3.1 INTRA-REGIONAL ROUTE AGGREGATION POLICIES

- a) Backbone routers with intra-regional connectivity shall be configured with aggregate routes to ground systems for ATSC and AINSC applications at an intra-regional level.

3.3.2 INTRA-REGIONAL ROUTE PREFERENCE POLICIES

- a) Backbone routers with intra-regional connectivity shall accept intra-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.
- b) **Recommendation.** Backbone routers with intra-regional connectivity should only accept inter-regional or intra-regional aggregate routes on these connections.
- c) Routers with local connectivity shall accept intra-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.
- d) **Recommendation.** Non-Backbone routers with local connectivity may accept intra-regional aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers.

Note. – Non-backbone routers that accept intra-regional routes must provide an appropriate level of performance to support the routing policies for intra-regional connectivity. Other alternatives for Non-Backbone transit routers are described in Appendix C.

3.3.3 INTRA-REGIONAL ROUTE DISTRIBUTION POLICIES

- a) Backbone routers with intra-regional connectivity shall distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.
- b) Routers with local connectivity shall distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.
- c) **Recommendation.** Non-Backbone routers with local connectivity may distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.

Note. – Non-backbone routers that distribute intra-regional routes must provide an appropriate level of performance to support the routing policies for intra-regional connectivity. Other alternatives for Non-Backbone transit routers are described in Appendix C.

3.4 POLICY FOR AGGREGATE ROUTES TO GROUND SYSTEMS FOR DISTINCT ROUTING DOMAINS WITHIN A STATE/ ORGANIZATION

Distinct Routing Domain-level aggregation permits advertisement of a single aggregate route which identifies all systems in a specific routing domain of a particular state or organization of an ICAO region. Aggregation at this level refers to aggregating NLRI fields to an NSAP prefix up through the complete ARS field. (Reference 5) ATN routers connecting to adjacent routers within a particular state or organization, i.e., with intra-state or intra-organizational connectivity, are said to have “local” connectivity.

3.4.1 DISTINCT ROUTING DOMAIN ROUTE AGGREGATION POLICIES

- a) **Recommendation.** ATN routers serving individual routing domains should be configured with aggregate routes to all ground systems for ATSC and AINSC applications.

3.4.2 DISTINCT ROUTING DOMAIN ROUTE PREFERENCE POLICIES

- a) **Recommendation.** ATN routers with local connectivity should accept state/organizational-level aggregate routes to ground systems for ATSC and AINSC applications from adjacent ATN routers within the same state or organization.

3.4.3 DISTINCT ROUTING DOMAIN ROUTE DISTRIBUTION POLICIES

- a) **Recommendation.** ATN routers with local connectivity should distribute state/organizational-level aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers within the same state or organization.

3.5 LOCAL STATE/ORGANIZATIONAL ROUTING POLICIES

Individual states/organizations may have additional routing policies consistent with the above policies for routes to ground systems. Such policies may include various local preferences or Quality of Service based routing, for example, routing based on line error rates, expense, delay, capacity, and priority.

3.6 CONFIGURATION OF ROUTES TO END ROUTING DOMAINS

The routing policies in sections 3.1 through 3.5 apply to transit routing domains, i.e, routers which connect to two or more other routers. However there are several end routing domains in the Asia/Pacific region where routers are connected to only one other router. In this case the routes may be statically configured in both routers rather than using IDRP dynamic routing procedures. Note however that the router in the transit routing domain must still distribute a route to the end routing domain to other routers. Note further that the distributed route must reflect the actual reachability of the end routing domain. Thus if IDRP is not used to determine reachability to the end routing domain some other local means must be used, for example, detecting whether or not there is an X.25 connection.

4. POLICY FOR ROUTES TO AIRBORNE SYSTEMS

The policy requirements for ATN routers in the Asia and Pacific region for routes to airborne (i.e., mobile) systems are specified in this section 4. Policy requirements are next partitioned according to the types of policy concerns identified in section 1.5.2; that is, policy requirements are partitioned into aggregation policies, preference policies, and distribution policies.

Note 1. – This initial baseline document only contains recommended policies. This is primarily because the architecture for air-ground ATN routers has not yet been developed. Once more concrete plans for the implementation of airborne applications in the Asia and Pacific region are developed, additional requirements and/or recommendations may be added in future versions of this document.

4.1 POLICY FOR AGGREGATE ROUTES TO AIRBORNE SYSTEMS

Aggregation of routes to airborne (i.e. mobile) systems permits advertisement of aggregate routes to airborne systems rather than advertisement of individual routes to every airborne system. Aggregation of routes to mobile systems may occur at a coarse level to “all mobile” or may occur at an “administrative domain” level of all aircraft belonging to an airline or the General Aviation aircraft of a given country of registration. Aggregation to “all mobile” refers to aggregating NLRI fields to an NSAP prefix up through the VER field where the value of the VER field may be “41” for Mobile AINSC routes or “C1” for Mobile ATSC routes. Aggregation at an administrative domain” level refers to aggregating the NLRI fields to an NSAP prefix up through the ADM field.

4.1.1 ROUTE AGGREGATION POLICIES FOR ROUTES TO AIRBORNE SYSTEMS

- b) **Recommendation.** - ATN routers in an Air-Ground subnetwork (e.g., backbone routers for an Air-Ground Service Provider) with intra-regional connectivity (to the regional backbone routers) should be configured with aggregate routes to airborne systems for ATSC and AINSC applications at an “administrative domain” level.

Note –The basic assumption of this recommendation is there may be multiple service providers operating in a region and that an airline will contract with one service provider as the primary provider of air-ground service and optionally contract with a second service provider for back-up service.

- c) **Recommendation.** - ATN routers in the regional backbone with local connectivity should be configured with aggregate routes to airborne systems for ATSC and AINSC applications at an “all mobile” level.

4.1.2 ROUTE PREFERENCE POLICIES FOR ROUTES TO AIRBORNE SYSTEMS

- a) **Recommendation.** - ATN ground routers in the regional backbone with intra-

regional connectivity to ATN routers in an Air-Ground subnetwork should accept aggregate routes to airborne systems for ATSC and AINSC applications from adjacent ATN routers at an “administrative domain” level.

- b) **Recommendation.** - ATN ground routers in the regional backbone with intra-regional connectivity to ATN routers in an Air-Ground subnetwork should accept routes to airborne systems for ATSC and AINSC applications from adjacent ATN routers at a “mobile routing domain” level, i.e., accept routes to individual aircraft.

Note. – This policy permits advertisement of routes to individual aircraft for cases where there are multiple Air-Ground subnetworks. It permits routing to the Air-Ground subnetwork with actual connectivity to an aircraft.

- c) **Recommendation.** - ATN ground routers with local connectivity to ATN routers should accept aggregate routes to airborne end systems for ATSC and AINSC applications from adjacent ATN routers at an “all mobile” level.

Note. – Non-backbone routers accept routes at an “all mobile” level from backbone routers and from other non-backbone routers.

4.1.3 ROUTE DISTRIBUTION POLICIES FOR ROUTES TO AIRBORNE SYSTEMS

- a) **Recommendation.** - ATN ground routers with intra-regional connectivity to ATN routers should distribute aggregate routes to airborne systems for ATSC and AINSC applications at an “administrative domain” level to adjacent ATN ground routers.
- b) **Recommendation.** - ATN ground routers with intra-regional connectivity to ATN routers should distribute routes to airborne systems for ATSC and AINSC applications at a “mobile routing domain” level to adjacent ATN ground routers.
- c) **Recommendation.** ATN ground routers with local connectivity to ATN routers should distribute aggregate routes to airborne systems for ATSC and AINSC applications at an “all mobile” level to adjacent ATN ground routers.

Appendix A – Scenarios for Distribution of Routes to Ground Systems

This appendix contains example scenarios which illustrate distribution of inter-regional, intra-regional, and routing domain level routes in accordance with the Asia Pacific routing policy. Note that in these examples the Asia and Pacific regions are defined as distinct regions. This is to illustrate the concept of hierarchical distribution of routing information. In practice, the Asia and Pacific regions are grouped together as a combined region with a single address prefix. See Appendix B. Note also that although the scenarios are for ATSC applications, the principles apply also to AINSC applications.

Scenario A-1 Inter-Regional Route Distribution

Figure A-1 depicts routing policy operation for distribution of inter-regional routes for ATSC applications in the Asia Region.

STEP 1.

Ground-Ground Router A (GG A) in State S1 of the Pacific Region is a backbone router with inter-regional connectivity to the Asia Region. In accordance with 3.1.2.1.a GG A is configured with an aggregate route to ground systems for ATSC applications.

STEP 2.

In accordance with 3.1.2.3.a GG A distributes the aggregate route to adjacent Ground-Ground Router B (GG B) in State S3 of the Asia Region. In accordance with 3.1.2.2.a GG B accepts this route and installs it in its routing database.

STEP 3.

In accordance with 3.1.2.3.b GG B distributes the aggregate route to adjacent Ground-Ground Router C (GG C) in State S2 of the Asia Region. In accordance with 3.1.2.2.c GG B accepts this route and installs it in its routing database.

STEP 4.

In accordance with 3.1.2.3.b GG C distributes the aggregate route to adjacent Ground-Ground Router F (GG F) in State S1 of the Asia Region. In accordance with 3.1.2.2.c GG F accepts this route and installs it in its routing database. In accordance with 3.1.2.3.c GG C distributes the aggregate route to adjacent Ground-Ground Router D (GG D) also in State S2 of the Asia Region. In accordance with 3.1.2.2.d GG D accepts this route and installs it in its routing database.

STEP 5.

In accordance with 3.1.2.3.c GG D distributes the aggregate route to adjacent Ground-Ground Router E (GG E) also in State S2 of the Asia Region. In accordance with 3.1.2.2.d GG E accepts this route and installs it in its routing database.

STEP 6.

In accordance with 3.1.2.3.a GG F distributes the aggregate route to an (unidentified) adjacent Ground-Ground Router in an adjacent Region.

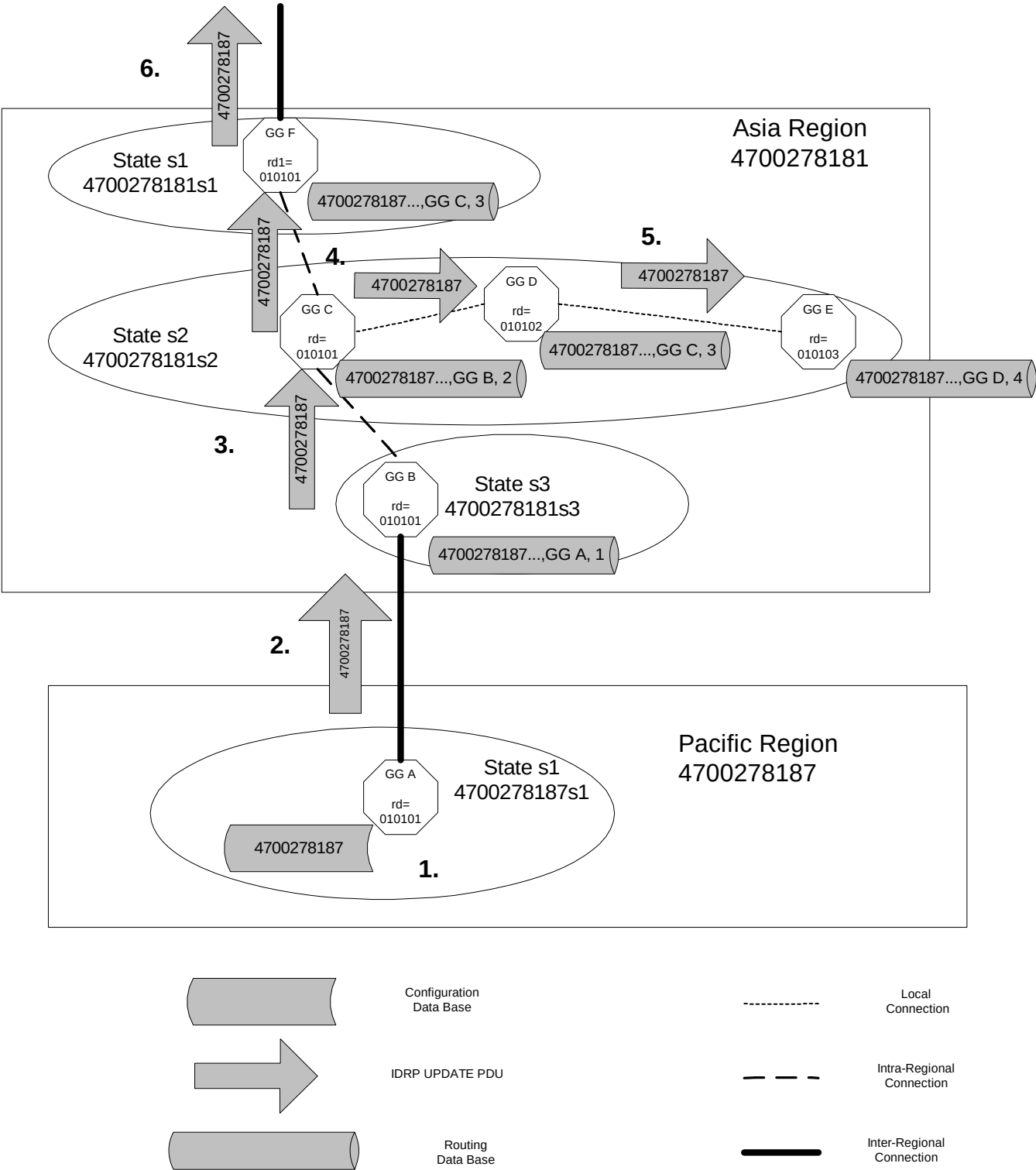


Figure A-1 Inter-Regional Route Distribution

Scenario A-2 Intra-Regional Route Distribution

Figure A-2 depicts routing policy operation for distribution of intra-regional routes for ATSC applications in the Asia Region.

STEP 1.

Ground-Ground Router B (GG B) in State S3 is a backbone router with intra-regional connectivity in the Asia Region. In accordance with 3.1.3.1.a GG B is configured with an aggregate route to ground systems for ATSC applications.

STEP 2.

In accordance with 3.1.3.3.a GG B distributes the aggregate route to adjacent Ground-Ground Router C (GG C) in State S2 of the Asia Region. In accordance with 3.1.3.2.a GG C accepts this route and installs it in its routing database.

STEP 3.

In accordance with 3.1.3.3.a GG C distributes the aggregate route to adjacent Ground-Ground Router F (GG F) in State S1 of the Asia Region. In accordance with 3.1.3.2.a GG B accepts this route and installs it in its routing database. In accordance with 3.1.3.3.b GG C distributes the aggregate route to adjacent Ground-Ground Router D (GG D) also in State S2 of the Asia Region. In accordance with 3.1.3.2.c GG D accepts this route and installs it in its routing database.

STEP 4.

In accordance with 3.1.3.3.b GG D distributes the aggregate route to adjacent Ground-Ground Router D (GG E) also in State S2 of the Asia Region. In accordance with 3.1.3.2.c GG E accepts this route and installs it in its routing database.

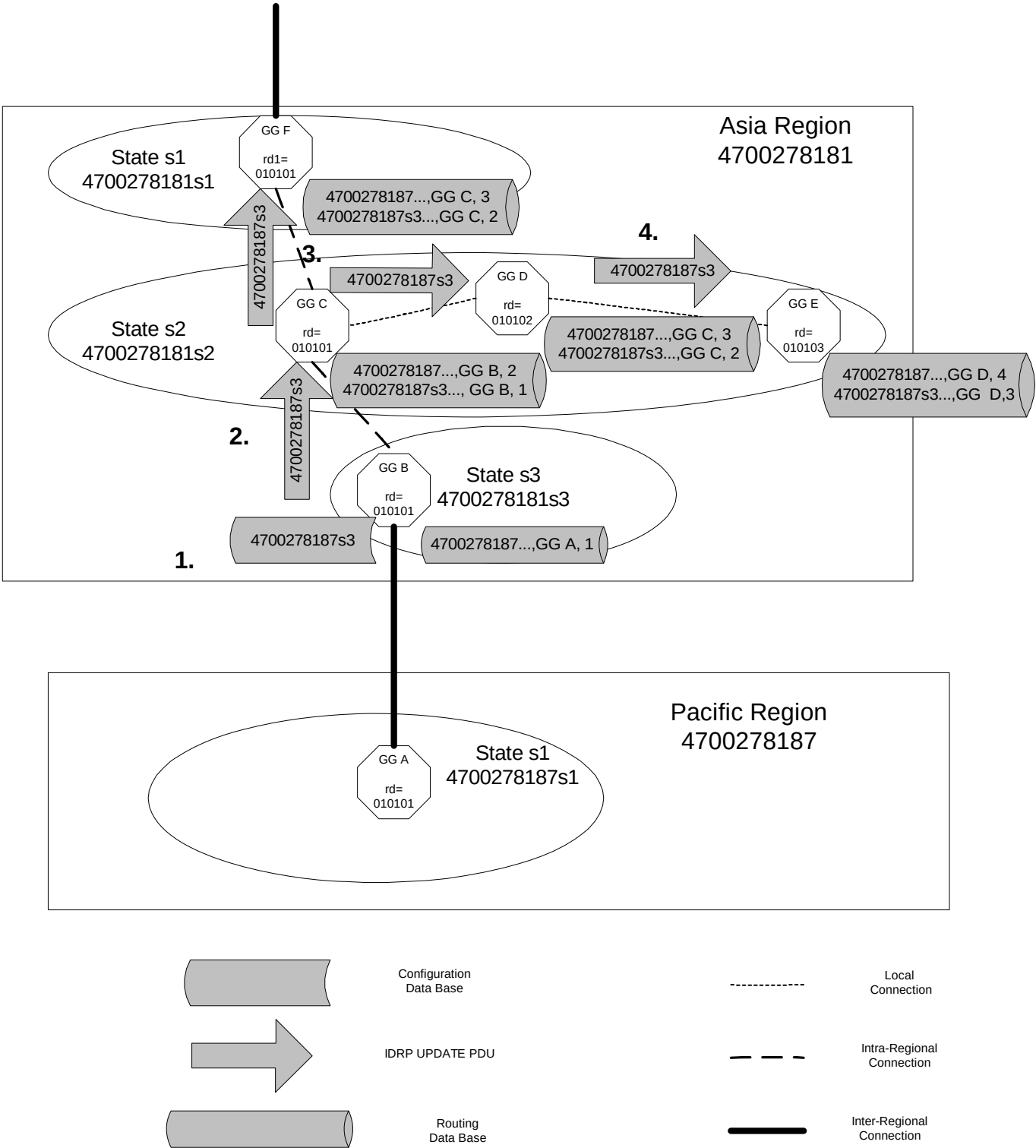


Figure A-2 Intra-Regional Route Distribution

Scenario A-3 Routing Domain Route Distribution

Figure A-3 depicts routing policy operation for distribution of routing domain routes for ATSC applications in the Asia Region.

STEP 1.

Ground-Ground Router E (GG E) in State S2 is a (non-backbone) routing domain level router with local connectivity in the Asia Region. In accordance with 3.1.4.1.a GG E is configured with an aggregate route to ground systems for ATSC applications.

STEP 2.

In accordance with 3.1.4.3.a GG E distributes the aggregate route to adjacent Ground-Ground Router D (GG D) also in State S2 of the Asia Region. In accordance with 3.1.4.2.a GG D accepts this route and installs it in its routing database.

STEP 3.

In accordance with 3.1.4.3.a GG D distributes the aggregate route to adjacent Ground-Ground Router C (GG C) also in State S2 of the Asia Region. In accordance with 3.1.4.2.a GG C accepts this route and installs it in its routing database.

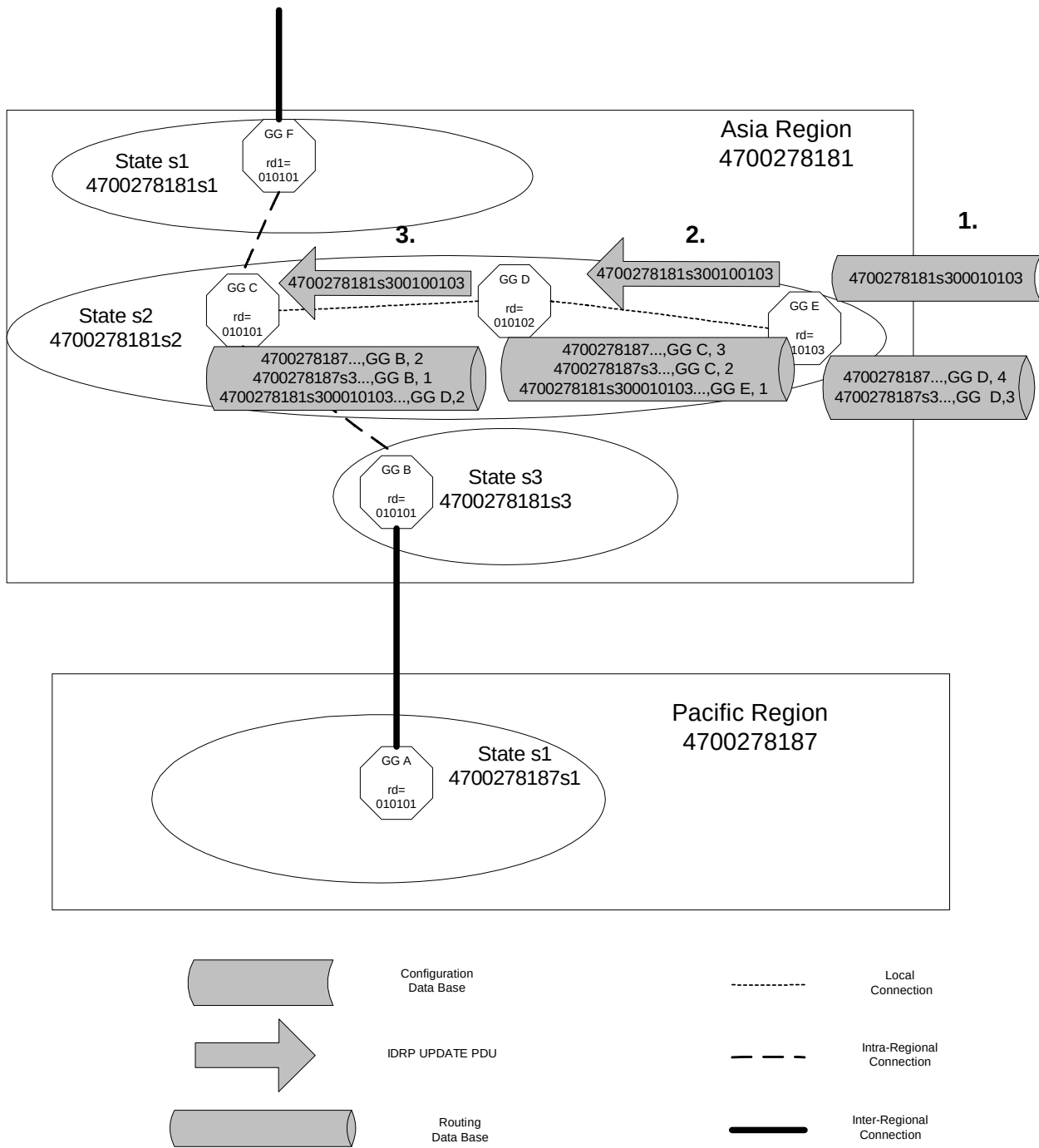


Figure A-3 Routing Domain Route Distribution

APPENDIX B

Routing with a Common Address Prefix for the Asia and Pacific Regions

B-1. Asia/Pacific ATN Routing Policy Goal

Section 2.1 of this document has specified an IDRP Routing policy with the following general routing policy goal:

- Asia and Pacific region ATN routers will provide global shortest path connectivity with a minimal exchange of routing information.

B.2. ATN Hierarchical Address Structure and Routing Prefixes

The ATN uses a hierarchical address structure to reduce the amount of routing information advertised on an inter- and intra-regional basis. The general ATN address structure is depicted in Figure B-1.

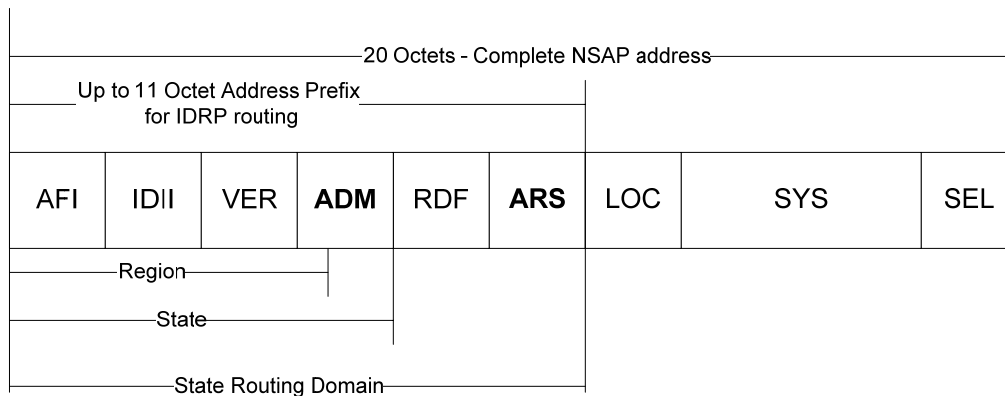


Figure B-1 – ATN NSAP Address Structure

The Asia/Pacific Region the NSAP addressing plan uses the first 5 octets of an NSAP address (up to the 1st octet of the ADM field) to designate an ICAO Region. The first 7 octets of an NSAP address (including the second two octets of the ADM field) designate a states or organizations within a Region. The first 11 octets (including the ARS field) designate individual routing domains within a state or organization.

Given the above generic address allocation the following address prefixes will be advertised in accordance with the Asia/Pacific Routing Policy.

- Routers with inter-regional connectivity will advertise a regional prefix of 5 octets on the inter-regional interface to indicate they can reach all systems in the region,
- Routers with intra-regional connectivity will advertise a prefix of 7 octets on the intra-regional interface to indicate they can reach all systems within the state or organization, and
- Routers with local connectivity will advertise a prefix of 11 octets for individual routing domains in the state or region.

B.3. Consequence of Aggregation on Inter-regional boundaries

Because systems are aggregated under a single address prefix, a router receiving multiple advertisements may not always choose the shortest path.

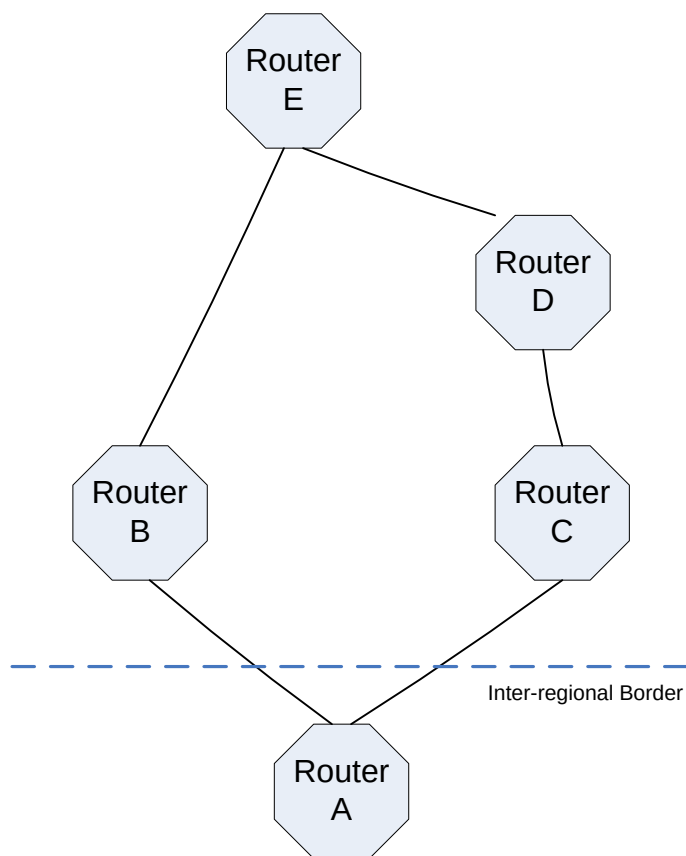


Figure B-2 – Routers with Inter-Regional Connectivity

Figure B-2 depicts Router A connected to two routers (B and C) across an inter-regional boundary. In accordance with the routing policy, routers B and C will advertise the same regional 5 octet prefix indicating that they can reach all systems in the region. In addition Routers B and C will advertise a hop count of 1 since they are one hop away from A. Given two paths of equal length to the same prefix, Router A will select the Router which happens to have the lowest address. However, in order to reach Router D via the shortest path, Router A should select the path via Router C. Similarly to reach Router E via the shortest path, Router A should select the path via Router B.

B.3. General Recommendation to eliminate inter-regional borders

In order to achieve shortest path routing, it is proposed that the inter-regional border be eliminated whenever possible such that Router A belongs to the same region as the other routers. In this case, following the policy, Router A will receive a 7 octet prefix for Routers D and E from both Router B and

Router C but the hop count will be different. Using the hop count Router A can select the shortest path.

B.4. Eliminating Inter-regional borders in the Asia/Pacific Region

Figure B-3 depicts Asia/Pacific Routing topology. The dotted lines are cases where there is inter-regional connectivity in accordance with the NSAP Addressing Plan.

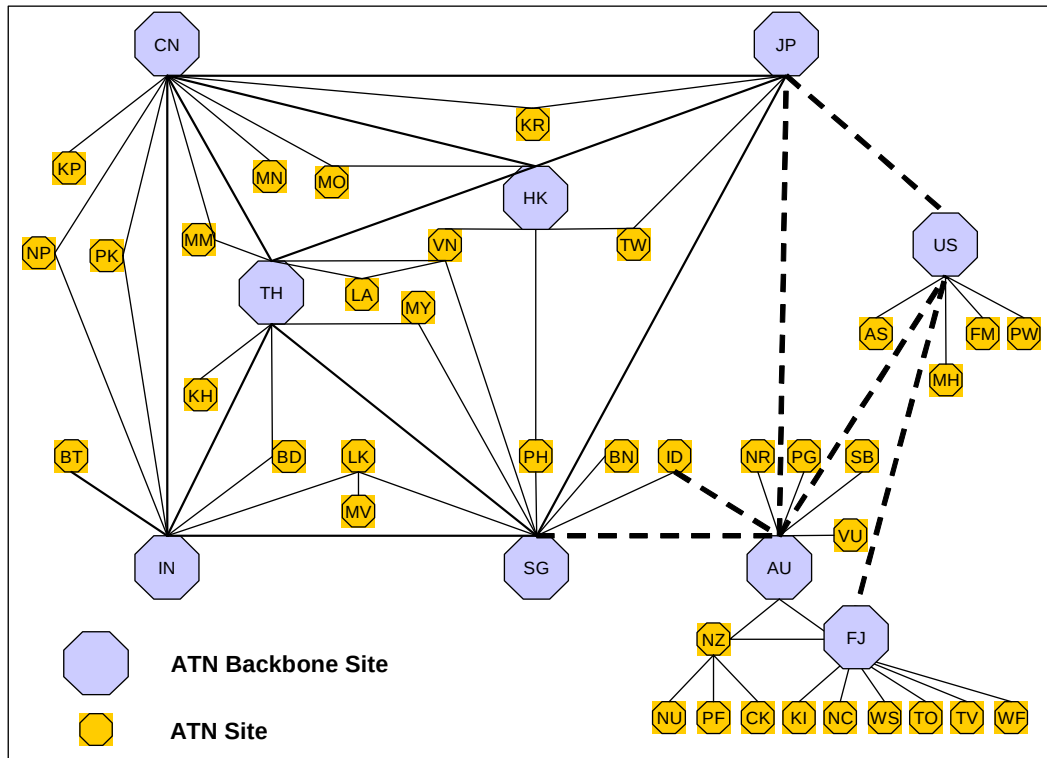


Figure B-3 – Asia, Pacific, and NAM Inter-Regional Connectivity

B.4.1 Eliminating the Asia/Pacific Border

As an example we may consider the case of Australia (AU). From the diagram it can be seen that Australia (AU) will receive aggregate prefixes from Japan (JP) and Singapore (SG). And so for example to reach China (CN) the desired path would be via Japan (JP) but to reach India the desired path would be via Singapore (SG). This can be accomplished by combining the Asia and Pacific regions into a single “combined region”. The effect will generally be that shortest path routing will be achieved across the two regions.

B.4.2 Eliminating the Asia/Pacific to NAM border

If the Asia and Pacific regions are combined but the connections to the US are still inter-regional, then the US will receive the same aggregate prefix from Japan, Australia, and Fiji. Consequently, the US may not select the shortest path to routers beyond the interfacing router. In order to avoid this situation, the inter-regional border to the US may also be eliminated by making the US part of a combined Asia and Pacific region for routing purposes. The routing prefix uses the hexadecimal value of ‘91’ in the first octet of the ADM field to signal the combined Asia/Pac region.

APPENDIX C

Non-Backbone Transit Routers

C-1. Introduction

The routing policy in this document distinguishes between backbone and non-backbone routers. See Figure C-1. In the event of a failure of a connection between two backbone routers (A and C), the next shortest path between these routers will be selected. This may result in a path through a non-backbone router being selected.

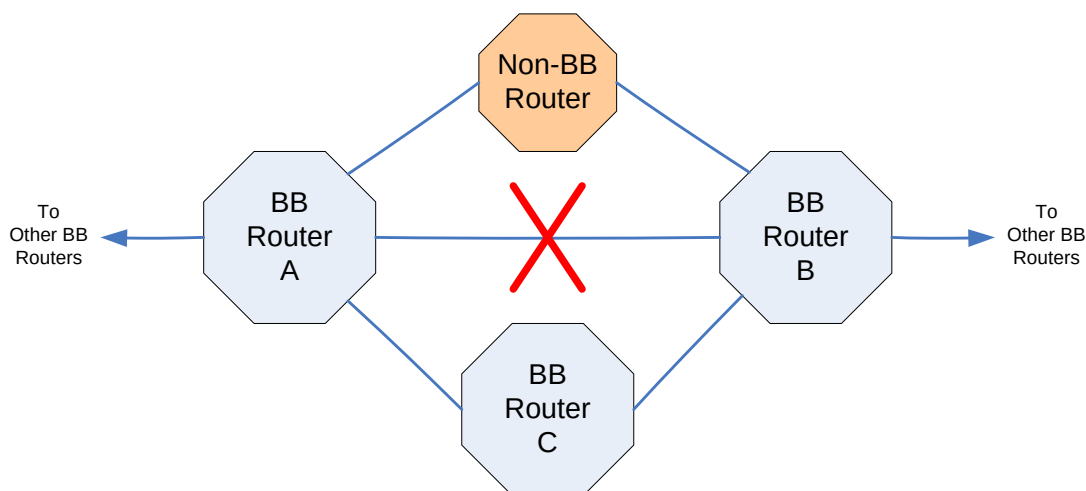


FIGURE C-1: ALTERNATE PATH VIA BACKBONE OR NON-BACKBONE ROUTER

This may occur even if there is an equal hop path through backbone routers (i.e, through router C). This can happen because of the way IDRP selects paths. If there is more than one path with the same lowest hop count, IDRP will compare the NET addresses of the adjacent routers on each path as integers and select the “lowest”. In the Asia/Pac region this can occur in several situations. From Figure B-3 it can be seen that the following non-backbone routes could be selected.

Failed Connection

Japan–Hong Kong

Japan–China

China–India

Thailand–India

India–Singapore

Alternate Path

alternate path via Taiwan instead of Beijing

alternate path via Republic of Korea instead of Hong Kong

alternate path via Pakistan instead of Thailand

alternate path via Bangladesh instead of Beijing or Singapore

alternate path via Sri Lanka instead of Thailand

In general non-backbone transit routers are not required to handle intra-domain traffic but they are not precluded from doing so. Recommendation 3.3.3.c specifies that “Non-Backbone routers with local connectivity may distribute intra-regional aggregate routes to ground systems for ATSC and AINSC applications to adjacent ATN routers.” This recommendation has an important caveat however. Non-backbone routers that distribute intra-regional routes must provide an appropriate level of performance to support the routing policies for intra-regional connectivity. If a non-backbone router does not have the appropriate level of performance there are several alternatives which may be selected.

C-3. Alternatives

Alternative 1 – Preference for alternate routes via Backbone Routers

When the connection between two backbone routers fails and there are multiple alternate paths available as depicted in Figure C-1, preference should be given to the backbone path, i.e., via backbone router C. If a backbone path is not available and there are multiple non-backbone paths then the link with the greatest capacity (speed) should be selected. This local policy may be summarized as follows:

If there are multiple paths with the same lowest hop count, PDUs should be forwarded on the ATN backbone path, if available, otherwise on the link with the greatest speed.

Alternative 2 – Operate as Transit Router only for directly connected Backbone Routers

A non-backbone transit router may accept routes for the directly connected backbone routers and for other routers in the network; however, it could have a more restrictive policy regarding which routes it will advertise. Specifically a non-backbone transit router could be configured to only distribute routes for directly connected routers. For example, the non-backbone router in Figure C-1 would distribute a route for router A to router B but not other intra-regional routes received from router A. In the other direction, the non-backbone router in Figure C-1 would distribute a route for router B to router A but not other intra-regional routes received from router B. The net result of this approach is that the non-backbone router could be an alternate path only for traffic between the adjacent backbone routers. How this is accomplished is a local matter. One possible method would be to statically configure these routes in the non-backbone router.



International Civil Aviation Organization
Asia and Pacific Office

**AMHS/ATN NETWORK MANAGEMENT OPERATIONAL
PROCEDURE GUIDELINES**

September 2009

AMHS/ATN Network Management Operational Procedure Guidelines

SECTION 1 –GENERAL

1.0 Introduction:

The **Aeronautical Message Handling System (AMHS)** is a global telecommunications message handling service that requires support and cooperation from multiple organizations and states regionally and around the globe. Personnel from the states, industry, and various private commercial organizations have met for many years to define a structure and guidance for the service.

Because of the basic principle of equal status among all States operating Communications Centers, no provision has been made for unique or special functions, including network management to be performed at any single specific place in the network: any function which is performed at one Center would or should be performed at all Centers. The existing and former situation Aeronautical Fixed Telecommunications Network (AFTN) does not contain or even allow the presence of a non-distributed, i.e. centralized network management function. It must, however, be recognized that one of the reasons for the permanence and robustness of the AFTN is the distribution of operational responsibility. Any introduction of non-distributed functions has to consider carefully the possibility of keeping distributed operational functions for stability reasons.

The current setting of AFTN operation is based on equal distributed function with the fixed centers with dedicated circuit network to support adjacent Flight Information Regions (IFRs) flight exchange. If any disruptions of service occur, the impacted center will coordinate with its adjacent center for backup and traffic diversion.

In the AMHS environment, either using ATN over X.25 subnet or TCP/IP network, the traffic is expected to be diverted automatically. This means, some centers will receive direct traffic that they never encountered in AFTN environment.

Furthermore, the introduction of AMHS with two addressing schemes along with many different network protocols such as ATN over X.25subnet, ATN over IP Subnet, and IPv4 and IPv6 over a TCP/IP network will significantly increase the possibility of the rejection of messages.

Sustaining service is critical during operations and implementation and is required to ensure that AFTN and AMHS will co-exist operationally for a long period of transition. This will make Communication Centers a very important part of transitional and operational activities to quickly resolve any message rejection or processing of unknown delivery problems.

In most all cases the maintenance and operation of Communication Centers is a local matter. However, to maintain a high level of operational reliability and performance there are critical items, procedures, and methods that must be coordinated and shared between and among network centers. Communications Centers must assure conformance to message delivery and format standards as well as accepted telecommunications and network protocols identified for use by the AMHS in ICAO documentation.

Therefore, the introduction of centralized processes and procedures into the Communication Centers will provide for a logical centralized network operation in a decentralized physical network structure.

1.1 Purpose

The AMHS will serve to replace the existing AFTN system. This document provides guidance in the regional, global, and local operation of the AMHS systems located in and associated with Communication's Centers operating AMHS systems or user agents.

1.2 Scope:

This document covers areas deemed necessary for the efficient and effective operation of regional and global AMHS message handling systems distributing critical and necessary information used to facilitate the efficient movement of aircraft in the global environment.

1.3 Application:

Policies and processes applied by this document are published and available in ICAO regional or global documentation relating to ATN, AMHS, Standards and Recommended Practices as well as relative technical guidance.

SECTION 2 AMHS OVERVIEW

2.0 Introduction

The AMHS is a message handling system that is owned and operated by ICAO member States or their agents and provides high-speed data communication and message exchange between other AMHS locations in a global or regional network environment.

2.1 AMHS:

The AMHS is comprised of Message Transfer Agents (MTAs), Message Stores (MSs), User Agents (UAs), Access Units (AUs) and Directory User Agents (DUAs). Routers and telecommunication backbones connect AMHS communication center locations and User Agents to facilitate data exchange and transmission between users and suppliers. The AMHS employs the X.400 suite of recommendations for message handling and delivery.

2.2 AMHS Message Communication Standard

The AMHS, employed by or contracted by member states or their agents, will conform to ICAO standards for message format and message types. Any deviation from the standards must be approved by ICAO and coordinated with member States.

2.3 AMHS Data Telecommunication Standard

AMHS network center participants and providers will utilize the most efficient telecommunications circuits that comprise the backbone circuits between AMHS routing and message transfer agent locations. AMHS participants will conform to and utilize data telecommunications protocols and methods identified and approved in applicable ICAO documentation.

SECTION 3 ORGANIZATIONAL RESPONSIBILITIES

3.0 Introduction

This section provides information on the management approach that will be used for AMHS and the responsibilities of organizations that own, operate, and support AMHS systems.

3.1 AMHS Management Approach

The AMHS will employ a matrix management approach to provide technical systems and services under the guidance of network management policies.

3.2 Management Functions

AMHS network management will be comprised of 5 basic functions and modeled after the OSI network management standard. The 5 functions are:

1. Configuration Management,
2. Fault Management,
3. Performance Management,
4. Security Management,

5. User Access Management.

3.3 Organizations and Roles:

It is the basic responsibility of all AMHS providers and users to supply the following basic information to other providers and users that they normally coordinate and communicate with in the daily operation of the AMHS.

1. Points of contact and telephone numbers for:
 - a. Network operations desk.
 - b. Communication Center Management, first and second levels
 - c. Engineering and planning
2. Maintenance and restoration activities
3. System changes and configuration changes
4. Modifications

All network activities modifications and corrective actions will be coordinated through these points of contact, beginning at the lowest and most practical level.

SECTION 4 CONFIGURATION MANAGEMENT

4.0 Introduction

It will be the responsibility of AMHS managers to provide an initial operational baseline configuration of the functional and physical configuration of their systems. This information will be shared and accessible to other AMHS participants. Changes to this baseline will be shared, tested, and, coordinated for implementation before they become operational.

The importance of strict configuration management is a paramount element of a global network such as the AMHS. Modifications can have far reaching global effects greater than those encountered today when implementation and change failures occur in the current AFTN network.

4.1 Operational Baseline

The initial operational baseline will not be modified without proper regional and global coordination. This is to assure that the addition or modifications of elements in the AMHS have passed proper conformance and implementation testing before being deployed. This activity will provide a foundation to limit and mitigate the risks associated with changes.

4.2 Configuration Control

While the procurement and operation of AMHS is mostly a local matter it is important that elements of software and hardware used in these systems conform to the standards identified by ICAO. Additionally participants cannot act unilaterally with modifications and changes to their AMHS without the assurance to other participants that their changes will not adversely impact the system locally, regionally, or globally.

Any changes will be coordinated and advertised globally and shall not be implemented until a reasonable comment period has expired. This comment period will be 30 days from the initial announcement of the proposed change. The change will be considered approved, without further comment, and be implemented within 7 days of the comment period expiration.

It is recommended that configuration control measures be initiated in all regions with global coordination between the regions managed by ICAO.

4.3 Routine Modifications and Configuration Changes

Any modifications that occur as a result of software, hardware, informational updates, and the implementation and installation of modified or new hardware, shall be fully coordinated for fault and risk mitigation.

4.3.1 Address changes

Address changes will be closely coordinated among Communication Centers to avoid the problems associated with Non Deliverable Reports (NDR.) The changes can then be applied and propagated during a predetermined and scheduled Aeronautical Information and Regulation Cycle (AIRAC) period

4.3.2. Routing, software, and hardware modifications

Routing, software, and hardware modifications not associated with restoration will only be initiated when regional and global databases have been modified, and comment and notification periods have been observed. The changes can then be applied and propagated during a predetermined and scheduled Aeronautical Information and Regulation Cycle (AIRAC) period

SECTION 5 FAULT MANAGEMENT

5.0 Introduction

System component failures and degradations in network service are usually noted first by operations personnel via alarms, reports and monitoring systems or by individual network users who notify the Communication Center. Therefore fault management functions start at the Communication Centers.

5.1 Elements of Fault Management

5.1.1. Monitoring

5.1.2. Detection

5.1.3. Notification

5.1.4. Restoration

5.1.5. Tracking

5.1 Organizational Functions for Fault management

5.1.1 Communication Center

The primary focus for fault management of the AMHS rests with the Communication Center personnel who perform the five basic elements of fault management as an integral function of their daily activities. The Communication Center maintains the latest versions of software and configurations for reloading elements in the event of a failure.

5.2.2 Engineering and second level support

These organizations assist in the resolution of system faults that require engineering expertise. These organizations will normally be alerted by the Communication Center who will provide a detailed description of the fault.

5.2.3. Telecommunications

It is the responsibility of all Communications centers to contact telecommunications vendors and providers in the event of reduced service or circuit failures.

5.2.3.1. Bi-lateral circuits

It is recommended that in the case of bi-laterally provisioned circuits between states or Communication Centers, the Center with the Eastern most geographic location be the primary point-of-contact for testing and restoration coordination activities. This does not reduce the responsibility of the associated facility to monitor and participate in fault location and restoration.

SECTION 6 SAFETY MANAGEMENT

6.0. Introduction

In order to provide continual and safe services when changes, modifications, policy amendments, and routine maintenance activities are conducted AMHS users and providers must practice Safety

Management System (SMS) activities. AMHS participants practice safety management by conducting and performing risk assessment and analysis and using the results to make decisions. The risk assessment and analysis must be predetermined, documented in a plan which must include the criteria for acceptable risk. The plan must be published and approved internally and with other affected AMHS Communication Centers and users. Guidance related to Safety Management can be found in ICAO Doc.9859 Safety Management System (SMS) Manual.

6.1. Risk Management Plan

Risk assessment and analysis must be predetermined, documented in a plan which must include the criteria for acceptable risk

6.2. Hazard Identification

The hazard analyses and assessments required in the plan must identify the safety risks associated with the system or operations under evaluation, modification or maintenance.

6.3. Risk Assessment

The risk assessment of the hazards examined must be compared to the acceptability criteria specified in the plan and the results provided in a manner and method easily adapted for decision making

6.4. Risk Mitigation

The risk management decision must include the safety risk assessment and the risk assessments may be used to compare and contrast options. The implementation of the plan will facilitate the mitigation of failures and incidents incurred as a result of system modifications, replacement and improvements.

SECTION 7 PERFORMANCE MANAGEMENT

7.0 Introduction

Performance management is the function that keeps the network and services operating efficiently when unexpected patterns or failures would otherwise cause network congestion and failed or delayed message delivery. Performance management uses control processes to anticipate network delivery problems and respond to them. This involves collecting and accessing network data, and determining whether changes, repair or corrective action is necessary. Performance management is akin to a long term monitoring function as opposed to “real time” fault and operational management functions.

7.1 Performance Management Concept

The concept used by Communication Center’s is a simple 4 step approach to performance management:

1. Identify performance parameters
2. Set performance objectives
3. Access conformance
4. Take control action to insure performance objectives are obtained

7.2 Performance parameters

Basic performance parameters and application of performance parameters are identified in ASIA/PACIFIC ATN/AMHS regional transition and planning documentation in the system management sections.

SECTION 8 SECURITY MANAGEMENT

8.0 Introduction

The implementation of security policy will be applied to all network resources and users to prevent unauthorized access to AMHS and computers connected to the AMHS and the applications running on those computers.

8.1. Policy

Users and providers will adhere to published regional and global ICAO security guidelines.

SECTION 9 USER ACCESS MANAGEMENT

9.0 Introduction

User access management complements security and network performance and is fundamental to the efficient operation of the network.

9.1 User conformance and interface testing

All new users and user modifications will be tested to assure compliance with ICAO prescribed standards, tolerances and interface control documentation. Testing performed and documented shall be in compliance with ICAO prescribed Conformance documents and Interface Control documents. No system shall be considered operational until formal operational testing has been performed in a live environment.

SECTION 10 VALIDATION TESTING

10.0 Introduction

Testing is essential to the operation of the network and provides verification that the introduction of new hardware, software or the modifications of hardware or software are accomplished with minimal impact on the operational network.

10.1 System changes, modifications and new hardware or software

All changes whether hardware or software will be thoroughly tested in off-line systems prior to implementation in the operational environment. Testing will strictly adhere to good fault mitigation practices and safety management guidelines as outline in related ICAO documentation.

10.1. Security testing

Testing will include tests associated with security vulnerabilities and the possible introduction of weaknesses into the operational network with the introduction of new or modified hardware or software.

SECTION 11 RECOMMENDED BEST PRACTICES

11. Introduction

Best Practices consolidate the elements of network and communication center management and focus on the procedures that are most productive and effective in a real time environment. In the AMHS environment Communications Centers will be more dependent on networks they do not own or control. In order to be effective they will need to be able to look through these networks to End Users and on to other Communication Centers, and ascertain the viability of the network and user elements. This ability will enable the Communication Center to make sound and swift decisions to increase the availability times of the entire AMHS infrastructure.

11.1. Availability

First and foremost base most monitoring on availability, and second monitor performance. While availability and performance go hand-in-hand they primary real time responsibility of the communication center is to assure the delivery of messages in an efficient manner and the availability of systems and networks is the most important operational element in when serving users. Rapid identification and replacement of failed elements of the AMHS or its supporting network are the primary concern.

11.2. Early detection

Strive for early detection of problems. Use monitoring tools that identify availability issues first. Rely more on real-time measurements and assessments rather than trend analysis. Use measurements that

screen problems to determine priority and establish priorities that reflect the return to availability as the highest priority.

11.3. Performance

Measuring performance is important but not key to operational management availability in operational management is primary. However performance statistics and measurements must be made to accomplish important trend analysis and data gathering. Ensure that monitoring tools used make these measurements and gather this information during periods of relatively low network activity.

11.3 Focus

Operational management should be focused on the availability of the AMHS to the users and communication centers. Centers should respond rapidly to failures and deploy swift measures to resume system and network availability. While trend analysis is important, in the operational environment it is more important to use tools, equipment, methods, and practices that facilitate a return-to-service at the earliest possible time.

11.4 Availability Keys

- a. End-User response times
- b. Message Queue size
- c. Transmission times (latency)
- d. Non-deliverable reports.
- e. Application Response times

SECTION 11 DOCUMENT REFERENCES

- (1) ICAO doc9739 ATN Manual
- (2) ICAO doc9896 Manual for the ATN using IPS Standards and Protocols
- (3) ICAO doc9880 ATN Technical provisions
- (4) ICAO doc9705 ATN Technical provisions
- (5) ICAO ATN SARP Annex 10 Volume III amendment 83
- (6) ICAO ASIA/PACIFIC ATN Regional Transition Documentation
- (7) ITU-T, ISO, IETF X.400
- (8) IETF RFC 1649
- (9) IETF RFC 2126
- (10) IETF RFC 1006
- (11) ICAO Doc 9859 Safety Management System (SMS) Manual
- (12) AMC Users Manual EuroControl, OneSky
- (13) ICAO Europe AMHS Manual version 3.1
- (14) ICAO Asia Pacific AMHS Regional Transition Documentation Guidelines Performance
- (15) ICAO Asia Pacific AMHS Regional Transition Documentation Guidelines Management



International Civil Aviation Organization
Asia and Pacific Office

**The Guidance Document for
AMHS Conformance Testing
(AMHS Manual)**

Version 3.0 – September 2009

Scope of the Document

This document has been developed by ATN ICG in order to present a comprehensive collection of test and checklist required to ensure conformance and compatibility pertaining to the implementation of AMHS facilities in the Asia and the Pacific Region.

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Document Control Log

Edition	Date	Comments	section/pages affected
0.11	30/03/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates to the document	all 1.2, 2.1.3, 2.2.1, 3.2.8.5, 5.4.3.2, 6.1.1, 6.1.2, 6.1.6, 7.1, 8
3.0	11/09/2009	Consequential updates based on amendment made in EUR AMHS Manual Version 3.0	

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1 Structure of the Asia and the Pacific AMHS Conformance Manual

- 1.1. The Asia and the Pacific AMHS Manual consists of 2 parts. The “Main Part” and the Appendices.

The main part will introduce and provide general guidance and detailed information on requirements concerning AMHS implementation in the Asia and the Pacific Region. They consist of:

1. Structure of the Asia and the Pacific AMHS Conformance Manual
2. Introduction
3. Asia and the Pacific AMHS Requirements
4. System implementation - Guidelines for system requirements
5. Tests and validation of systems
6. Miscellaneous

For better presentation and management, detailed documents, which have been produced on particular subjects initially addressed in the main body of the Manual, have been included as Appendices to the Manual.

- 1.2. The following Annexes to the Asia and the Pacific AMHS Manual have been produced:

- Annex A: Guidelines on Quality of Service (QOS)
- Annex B: AMHS Conformance Tests
- Annex C: ATN Router
- Annex D: AMHS Testing Requirements
- Annex E: AMHS Inter-Operability Tests
- Annex F: AMHS Pre-Operational Tests

2 Introduction

2.1 Background Information

2.1.1 AFS

The Aeronautical Fixed Service provides, among other things, for the exchange of messages pertaining to the safety of air navigation and the regular, efficient and economical operation of air services.

The following categories of message are handled by the AFS:

- distress and urgency messages
- flight safety messages
- meteorological messages
- flight regularity messages
- aeronautical information services messages
- administrative messages
- service messages

The principal users of messages in the above categories are ATS and the AIS, ATFM, MET and SAR Services which support and complement the ATS.

2.1.2 AFTN/X.25

Initially, the operational requirements for such an information exchange were met by the development of the Aeronautical Fixed Telecommunications Network. The AFTN provides a store-and-forward messaging service for the conveyance of text messages in ITA-2 or IA-5 format, using character-oriented procedures. Although AFTN served its purpose well for many years, AFTN technology has become outdated due to the fact that it remains bound to its telex/telegraphic origins.

The X.25 network provides a common transport service for the conveyance of binary or text application messages in an expeditious and reliable manner.

In the Asia and the Pacific Region, the X.25 provides the reliable backbone data communications infrastructure for the AFTN and a general data communications service to non-AFTN applications such as OPMET.

2.1.3 AMHS

The most recent development with regard to messaging in the ATS environment is the AMHS. The AMHS is a natural evolution from AFTN/X.25, replacing the telegraphic style of working with a modern Message Handling System based on international Standards.

It is presumed that the ATSMHS, being an ATN application, utilizes the infrastructure of the ATN inter-network. However this is not a prerequisite for the initial deployment of the ATSMHS.

There are several advantages of AMHS over AFTN/X.25 including:

- increased speed, capacity and throughput
- enhanced reliability
- extended functionality
- interoperability with other global messaging services
- security capabilities
- use of COTS equipment and services

The provisions pertaining to ATSMHS, such as SARPs and general guidance material, are contained in the following ICAO documents, which constitute the main references for this Manual.

- Annex 10, Volume II, Chapter 4 [1]
- Annex 10, Volume III, Part I, Chapter 3 [1]
- Doc 9705 Sub-Volume III [2]
- Doc 9739 Part III, Chapter 6 [3]
- ICAO Asia and Pacific Regions BASIC ANP [6]
- ICAO Asia and Pacific Regions ANP (FASID) [7]

2.2 ATSMHS Overview

2.2.1 General

The ATN SARPs for the Air Traffic Services Message-Handling Service (ATSMHS) define the ICAO store and forward messaging service used to exchange ATS messages between users over the ATN internet.

The set of computing and communication resources implemented by ATS organizations to provide the ATS Message Handling Service is commonly referred to as AMHS (ATS Message Handling System). The ATS Message Handling System SARPs are compliant with mature message handling systems standards such as ISO/IEC 10021 [10] and ITU-T X.400.

2.2.2 Functional Components

In terms of functionality, the ATSMHS comprises the following components:

- (a) the Message Transfer Agent (MTA) which performs the function of the Message switch,
- (b) the User Agent (UA) which performs the user access to the MTA and provides an appropriate user interface,
- (c) the Message Store (MS) which provides the intermediary storage between MTA and UA and is usually co-located with the MTA, and
- (d) the Access Unit (AU) which provides for intercommunication with other Messaging Systems.
- (e) the ATN router (Optional)

2.2.3 End systems

Three categories of ATN end systems are defined for the support of the ATS Message Handling Service:

- the ATS message server
- the ATS message user agent
- the AFTN/AMHS gateway

Together, these systems provide connectivity between users at ATN end systems and users at AFTN Stations in three different end-to-end configurations:

- a) from an AFTN/X.25 Station to another AFTN Station over the ATN
- b) from an AFTN/X.25 Station to an ATN End System, and vice versa
- c) from an ATN End System to another ATN End System with ATN routers

2.2.4 Levels of service

Two levels of service are defined within the ATS Message Handling Service:

- a) The Basic ATS Message Handling Service
- b) The Extended ATS Message Handling Service

The Basic ATS Message Handling Service meets the basic requirements of the MHS Profiles published by ISO as International Standardized Profiles (ISPs), and it incorporates additional features to support the service offered by the AFTN.

Compared to the service of the AFTN, the Basic ATS Message Handling Service offers some significant improvements such as:

- practically unlimited message length
- virtually no limit on the number of addressees of a message
- provision of non-delivery reports
- indication of the subject of a message

The Extended ATS Message Handling Service provides functionality in addition to those of the Basic ATS Message Handling Service such as the introduction of directory services and security mechanisms. Furthermore, in addition to IA-5 text, the extended service allows for the transfer of binary coded data, files etc.

The Extended ATS Message Handling Service is backwards compatible with the Basic ATS Message Handling Service.

2.2.5 Inter-operability

During the transition phase from the AFTN or the X.25 network to the AMHS the inter-operability between systems is achieved by the use of the AFTN/AMHS and X.25/AMHS gateways respectively.

The SARPs for the AFTN/AMHS gateways have been defined by ICAO.

3 AMHS Requirements

3.1 Quality of Service Requirements

The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the AMHS. The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

It is also a very subjective matter. So the detail of this section is only included in the appendix for reference. It is not a requirement but just a guideline for those who interests.

3.2 AMHS Addressing

3.2.1 Introduction

This section aims at the production of the AMHS Addressing Plan for all the Potential AMHS users in the Asia and the Pacific Region. This Plan should define the AMHS users addressing in an intuitive way and it should be comprehensible and meaningful to the human user and independent of the use (or not) of any type of Directory service such as X.500.

The Addressing Plan should also provide the rules to extend the addressing defined to other ATSOs (or not yet identified users).

3.2.2 Requirements

The AMHS addressing scheme should meet all of the following requirements:

- The addressing scheme should be as uniform as possible across all AMHS implementations in different Regions (as it is currently the case for AFTN addresses);
- The same addressing scheme should be maintained when indirect AMHS users (i.e. AFTN users or X.25 network users) migrate to AMHS. This implies that the AMHS addressing scheme is pre-defined and published before actual operation of the newly implemented AMHS;
- The addressing scheme should be independent of any constraints that may be imposed by Management Domains (MDs) in the Global MHS (i.e. the non-AMHS services operating globally as commercial services) or by national regulations that may vary from Region to Region; and
- The addressing scheme should allow for the interchange messages with MDs in the Global MHS.

3.2.3 MHS Addressing Structure

Each MHS address consists of a set of MHS standard components referred to as address attributes.

3.2.3.1 High Level MHS Address Attributes

The high level MHS attributes identify an MHS Management Domain as specified in ISO/IEC 10021-2, Section 18.3 [9]. They are determined by the structuring of Management Domains of the MHS Region / organization to which the address belongs. Each attribute must be registered with an appropriate registration authority to ensure that all addresses remain unambiguous. They are as follows:

- **Country (C) Name:**
This is mandatory, and the possible range of values of the attribute is drawn from the ISO 3166 register of country names. The register contains a special value 'XX', allocated for the purposes of international organizations (i.e. those that are established by international treaty) which do not 'reside' within any particular country;
- **Administrative Management Domain (ADMD) Name:**
This is mandatory, and its value is the name of an MHS Service provider in the context of a particular country. ADMD Names must be registered by a national registration authority. ADMDs registered under the 'XX' country must obtain that registration from the Telecommunication Standardization Sector of the International Telecommunication Union (ITU-T).
- **Private Management Domain (PRMD) Name:**
This is optional, and its value is the name of an MHS service usually operated by a private organization. PRMD names must be registered either with their respective ADMDs, or with a national register of PRMDs.

3.2.3.2 Low Level MHS Address Attributes

They are as follows:

- **Organization name:**
The organization name is the most significant naming attribute of the O/R address. Many organizations will operate as sub-naming authorities, allocating name space below their organization name attribute. The function of the domain names, both Administrative and Private, is to provide a relaying mechanism for delivery of the message to the intended destination. Relaying to the intended destination is made easier by the combination of a unique Organization Name within a unique PRMD
- **Organizational unit name:**
The organizational unit (OU) names are used within the context of a hierarchical addressing structure as identified by the organization name attribute, and should be used to identify meaningful subdivisions of that namespace. The X.400 O/R address allows for up to 4 specified, each up to 32 characters in length, in descending order of significance within the organizational hierarchy.

The other *OU name (OU2-4)* attributes can be used to further subdivide the namespace represented by the *OU1* attribute if necessary. Subordinate OU names should only be used if all superior OU names are in use.

- **Common Name:**
The common name attribute is the preferred way of Identifying distribution lists and computer applications, avoiding the (mis)use of the personal name attribute. The common name attribute can be up to 64 characters in length.

3.2.3.3 List of Attributes

A complete list of attributes with different information concerning on the Maximum length and type of allowed characters for each attribute type is provided in the following Table:

MNEMONIC FORM ADDRESS ATTRIBUTE	CHARACTERISTICS
Country name	2 alpha or 3 numeric
ADMD name	24 Printable String
PRMD name	24 Printable String
Organization name	64 Printable String
Organizational unit name	32 Printable String
Common name	64 Printable String

Table 1: Mnemonic O/R address attributes maximum length and types

3.2.4 AMHS Addressing Schemes

3.2.4.1 XF-Addressing Scheme

The AMHS SARPs describe a potential AMHS addressing scheme, the XF-Address (translated), composed of the following:

- a) an AMHS Management Domain Identifier;
- b) an organization-name attribute:
 - (1) as specified in ISO/IEC 10021-2, Section 18.3,
 - (2) taking the 4-character value “AFTN”, and
 - (3) encoded as a Printable String;
- c) an organizational-unit-names attribute:
 - (1) as specified in ISO/IEC 10021-2, Section 18.3,
 - (2) comprising a sequence of one single element, which takes the 8-character Alphabetical value of the AF-Address (AFTN-form address) of the user; and
 - (3) encoded as a Printable String.

Note 1. – An XF-Address is a particular MF-Address whose attributes identifying the User within an AMHS Management Domain (i.e. those attributes other than country-name, administration-domain-name and private-domain-name) may be converted by an algorithmic method to and from an AF-Address. The algorithmic method requires the additional use of look-up tables which are limited, i.e. which include only a list of AMHS Management Domains rather than a list of individual users, to determine the full MF-address of the user.

Note 2. – An MF-Address (MHS-form address) is the address of an AMHS user.

A summary of XF-Addressing Scheme can be found in the following table:

Attribute	Attribute value	Remarks
Country-name (C)	C = “XX”, as already obtained by ICAO from ITU-T	
ADMD-name (A)	A = “ICAO”, as already registered by ICAO at ITU-T	
PRMD-name (P)	P = private-domain-name, taking the value of the one or two-letter ICAO Nationality Letters as specified in Document 7910.	Default value will be used to ensure that the attribute value is always defined (see [8]).
Organization name (O)	O = “AFTN”, taking the 4-character value “AFTN” encoded as a Printable String	
Organizational unit-Name (OU1)	OU1 = the 8-letter AF-address (or AFTN indicator) of the considered user	

Table 2: XF-Addressing Scheme

3.2.4.2 CAAS Addressing Scheme

(a) High-level attributes

The following preferred high-level MD and address structure that meets all of the requirements outlined in paragraph 3.2.1 above:

- Country Name = 'XX';
- ADMD Name = 'ICAO';
- PRMD Name = preferred operating name assigned by each ATSO or group of ATSOs.

In this way, ICAO creates an international ADMD without addressing constraints imposed from outside ICAO and its members.

This scheme has placed two requirements on ICAO:

- To obtain from the ITU-T the registration of the name 'ICAO' (or some other suitable acronym agreed between ICAO/ANC and ITU-T); and
- To establish and maintain a register of PRMDs established by ATSOs that operate using the 'XX' + 'ICAO' address structure, in a way similar to Doc. 7910 [4] and Doc 8585 [5].

*Note. – This scheme does **not** require ICAO itself to operate the ADMD systems since this should be delegated to the participating ATSOs.*

This registration will enable the establishment of regional AMHS services and their later interconnection, and it will provide ATSOs with a good deal of stability within which they can develop their AMHS plans.

(b) Low-level attributes

The CAAS addressing scheme includes the following attributes:

- Organization name (O) = Region,
- Organizational unit 1 (OU1) = Location,
- Common name (CN) = User

Consequences:

- Each ATSO will define the values for the Organization-Name attribute (O) in its Management Domain. The character set to be used for this attribute will be the set of characters allowed by the ASN.1 type "Printable String".
- Organizational Unit 1 (OU1) will be the 4-character ICAO location indicator (as specified in ICAO Doc 7910 [4]) of the user.
- Common Name (CN) will either include the 8-character AFTN address for AFTN users, or the X.25 users (OPMET, AFTN Operator messages). It should be noted that this is partly redundant with the definition of OU1, however it is considered as unavoidable due to the evolutionary nature of the move from AFTN to AMHS.

3.2.5 Asia and the Pacific AMHS Addressing Plan**3.2.5.1 Asia and the Pacific AMHS Addressing Scheme**

Major concepts of this AMHS Addressing Plan are shown as follows:

Attribute	Attribute value	Remarks
Country-name (C)	C = "XX", as already obtained by ICAO from ITU-T	
ADMD-name (A)	A = "ICAO", as already registered by ICAO at ITU-T	
PRMD-name (P)	P = a name to be defined by each ATSO and registered by ICAO. Such a name will identify a State, an Organization or an organization within a State. .	In the absence of such a name being registered by the ATSO at ICAO, a default value will be used to ensure that the attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910.
Organization-name (O)	O = a value corresponding to local/national geographical information, e.g. a region or a geographical area within a State where the user is located.	The syntax and value are to be defined by the considered ATSO. The table associating such an organization-name to each ICAO location indicator (4 characters) needs to be registered and published by ICAO.

Organizational-unit-name (OU1)	OU1 = the ICAO location indicator (4 characters) of the considered user;
Common-name (CN)	CN = the 8-letter AF-address (or AFTN indicator) of the considered user, irrespective of whether it is a direct or indirect user.

Table 3: AMHS Addressing Plan

Example: MF AMHS Address of Singapore Com center:
/C=XX/A=ICAO/P=Singapore/O=CAASG/OU=WSSS/CN=WSSSYFYX

3.2.5.2 Distribution lists

The scheme to be used for the identification of AMHS Distribution Lists is the same as for potential AMHS users. The O and OU attributes would then represent the expansion point of the Distribution list.

3.2.6 Guidelines on PRMD Name assignment

3.2.6.1 Purpose

A PRMD-name attribute shall be formulated and assigned by each ATSO in order to uniquely identify the AMHS Management Domain of which the considered ATSO is in charge. Practically, the PRMD-name attribute identifies that part of the AMHS for which an ATSO is responsible.

3.2.6.2 Assignment rules

When assigning a value to the PRMD-name attribute the following rules should be considered:

- 1) It should be representative of the whole AMHS Management Domain for which the ATSO is responsible;
- 2) It should be as short as possible, an acronym would be sufficient;

Note. – The use of the two-letter ISO 3166 country codes (e.g. SG for Singapore, AU for Australia, US for the United States, etc.) is not advisable, as these codes are used as values of the Country-name attribute and not the PRMD-name attribute. This may confuse the operators.

- 3) It should be stable and not subject to changes unless there are duly justified technical and/or operational reasons;
- 4) It should be unique and unambiguous;

Note. – Care should be taken not to use a name or an acronym such as "civil aviation", "ATSO", "DGAC".

- 5) A default value has been reserved in order to ensure that this attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910 [4].

- 6) It should only comprise standard characters, e.g. no accented letters or letters that are only used in specific geographical areas;
- 7) The use of figures is not advisable.

3.2.6.3 Registration

Once assigned by the concerned ATSO, the PRMD-name value(s) shall be registered and published by ICAO after checking its uniqueness, as described in paragraph 3.2.6.2.

Note. – ICAO being the naming authority for AMHS addresses, there is no requirement to register the PRMD-name value(s) with a national authority.

3.2.7 Guidelines on Organization Name assignment

3.2.7.1 Purpose

The purpose of the Organization-name attribute is to allow each ATSO to split, if needed, the AMHS Management Domain (MD) for which it is responsible in distinct geographical areas.

Within a given AMHS Management Domain (identified by the "C", "A" and "P" attributes) two potential AMHS network architectures are possible:

- a) Centralised architecture, with one single ATS message server; and
- b) Geographically distributed architecture, with several regional ATS message servers.

It is to be noted that architectural aspects and addressing aspects are not completely linked together; in effect the agreed addressing scheme does not place any constraints on the AMHS network deployment plan.

3.2.7.2 Assignment rules

Before assigning a value to the Organization-name attribute, each ATSO should follow the following 3-step process:

- 1) Develop the general architecture of the AMHS to be implemented;
- 2) Define the location and the number of sites at which ATS Message Server could be installed within a foreseeable time frame (e.g. 5, 10 or 15 years); and
- 3) Chose and assign a name to each one of these sites.

A specific case is the situation where a single ATS Message Server is implemented in an AMHS MD, providing services to AMHS users that are all directly attached to this server (centralized architecture). For simplification, it was suggested that a single organization name (O) value be allocated to all location indicators in the AMHS MD.

Potential criteria for the selection of sites include:

- Geographic divisions, such as: North, South, East, West, etc.;
- Administrative divisions of the concerned ATSO, such as ATS, Meteorological, etc.;
- Operational divisions centred around the ACCs (if more than one ACCs exist);
- Operational divisions centred around the main airports;
- Mapping of the AMHS architecture on the existing AFTN / architecture;
- A mixture of the above criteria; and
- Other.

Note. – Care should be taken not to define too many geographical areas within a given AMHS MD as this may lead to less efficient message routing.

When assigning a value to the Organization-name attribute, the following rules should be considered:

1. It should be as short as possible;
2. It should only comprise standard characters, i.e. no accented letters or letters only used in specific geographical areas;
3. The use of figures is not advisable.

Note. – An ATSO should define different values for the Organization-name attribute only if it plans to implement a distributed AMHS architecture in the short, medium or long term future. ATSOs not planning to implement a distributed AMHS architecture should allocate a single value for this attribute.

3.2.7.3 Registration

Once assigned by the concerned ATSO, the Organization-name values shall be registered and published by ICAO, as described in paragraph 3.2.8.3.

Note. – ICAO being the registration authority for AMHS addresses, there is no requirement to register the Organization-name value(s) with a national authority.

3.2.8 Address conversion

3.2.8.1 Addressing Plans requirements

The selected address conversion strategy must take into account the following principles:

- The selected address conversion solution shall be able to support any X.400 addressing plan making use of any address form.
- The AFTN address of an AFTN or AMHS user is unambiguous, internationally recognized and shall not be replaced by another value.

The addresses to be considered are: AFTN, XF-form, CAAS and MF (non- CAAS). It can be concluded that:

- All Asia and the Pacific AFTN/AMHS gateways shall implement the conversions AFTN<=>XF;
- All Asia and the Pacific AFTN/AMHS gateways shall implement the conversions AFTN<=>ATSOs;
- All Asia and the Pacific ATSOs gateways should implement the conversions AFTN<=>ATSOs, together with an ATSOs address space within their remit (SARPs recommendation);
- To deal with the arrival of spurious XF addresses at the Asia and the Pacific ATSOs MDs from the global AMHS, the redirection XF=> ATSOs could be supported by all ATSOs;
- If an ATSO defined an MF (non-ATSO) address space, then all gateways would have to support the conversion AFTN<=> MF (non-ATSO). This is an undesirable alternative since a global and common CAAS has been recommended by ICAO.

3.2.8.2 Address Conversion Scenarios and Criteria

The identified scenarios are the following: single conversion, AMHS transit conversion, AFTN transit conversion and multiple transit conversion.

Once the scenarios have been established, the following considerations for the address conversion have to be performed:

- The result of the address conversion performed in an AFTN/AMHS gateway shall depend only on the pre-defined pair of unambiguously associated AFTN and AMHS addresses, and not on the gateway itself, according to the form published by ICAO and defined by the delivering MD.
- It is recommended that each gateway performing address conversion should have access to the minimal necessary information to perform mappings between AFTN addresses and AMHS addresses and vice-versa. The complete mappings between AFTN addresses and their AMHS equivalents should be published (in electronic form) and made available to all gateways that support address translations.
- The conversion process shall be easy to use and manage, and efficient.

As a conclusion, a compromise solution combining the use of algorithmic tables and X.500 directory is preferred for the address conversion.

3.2.8.3 General model for address distribution and gateway address conversion

A model of address distribution and gateway address conversion is depicted in [Figure 1](#) below. The figure represents information exchanges between ICAO and three ATSOs implementing AMHS Gateways, concerning address conversion. ATSO1 and ATSO2 implement a distributed address publishing service (APS), e.g. by means of ATN X.500 Directory Services. This allows electronic distribution. ATSO3 provides this information to ICAO for manual collation and distribution (e.g. on paper, electronic database), and does not support a directory.

The dotted arrows represent exchanges that are performed in a non-electronic way, e.g. through "paper" procedural exchanges. The full arrows represent exchanges that are performed electronically using appropriate communication protocols.

The model identifies a number of components that are necessary for address conversion:

- (1) Collection and distribution of the basic addressing information that establishes equivalence between the different addresses identifying each MHS/AFTN/X.25 user; the content of this information **must** be standardized and made available to all AMHS/AFTN/X.25 Gateways;
- (2) Access to, and/or import of the basic addressing information into AFTN/AMHS gateways. This depends on the particular gateway implementation;
- (3) Re-structuring the basic addressing information into a format suitable for use by each gateway's internal address conversion procedures (AMI). This is again Gateway implementation specific;
- (4) The internal procedures and data structures of the gateway (AMP and AMT) that make use of the re-structured addressing information. This is gateway implementation specific.

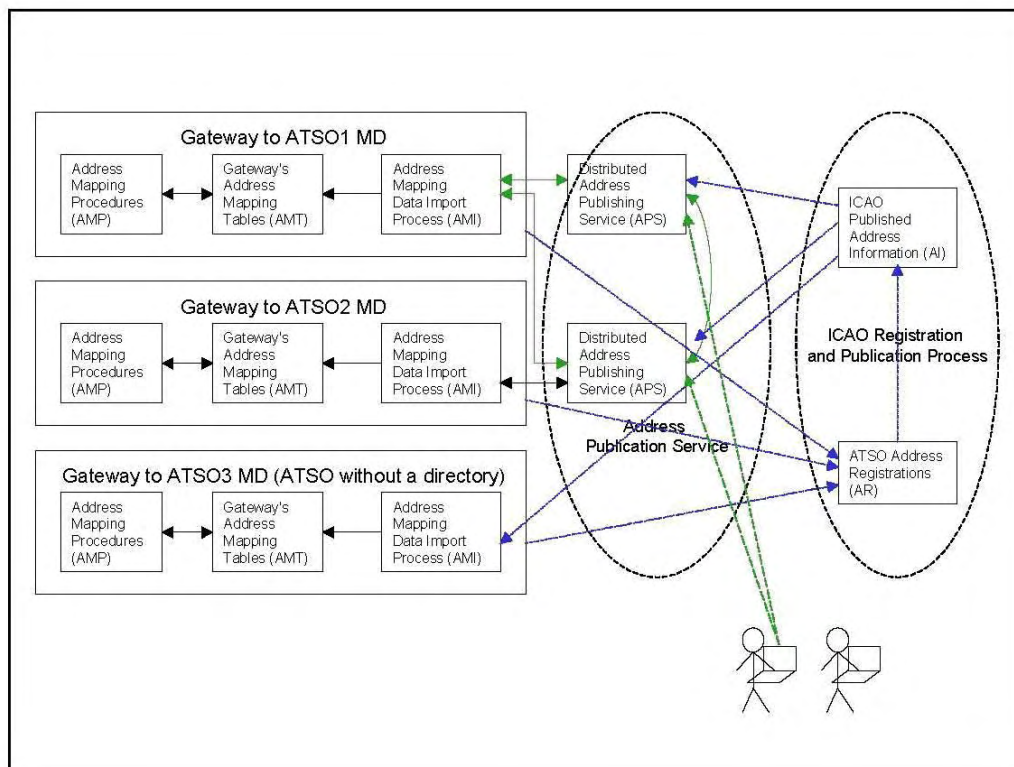


Figure 1: General model for gateway address conversion

The address mapping information content held in AMT and distributed through APS is identical in nature.

The structure of APS must be compatible with many different systems (e.g. Different ATSO's Gateways), and must therefore be standardized. There are a number of possibilities for structuring APS:

- As an X.500 Directory Information Tree, thereby enabling implementation of a Distributed APS;
- By some other electronic means (e.g. CSV files);
- On paper.

3.2.8.4 The impact of different paths through the AFTN and AMHS

There is also a potential need for messages to undergo multiple address conversions. In order to minimize message rejection and to regulate the responsibilities for conversions, the following rules should apply:

- Originating MDs (for originator's addresses) shall generate addresses according to the form published by ICAO and defined by the delivering MD (for recipient addresses);
- Delivering MDs shall be authorized to reject messages received with recipient addresses which do not comply with the address form published by ICAO and defined by the delivering MD.
- Delivering MDs should have the capability of redirecting potential internal XF addresses to the corresponding MF(S) form addresses for use within their delivering MD, for a transition period of at least 6 months after publication of the appropriate ICAO documentation.
- Transit domains should not attempt to perform any AMHS <-> AMHS Mapping unless a specific bilateral agreement has been established with the delivering MD (for recipient's addresses) or the originating MD (for originator addresses). Transit MD should only use the attributes C, A, P (which are invariant and predetermined for all AMHS address forms in the ATS) in selecting a message route.

3.2.8.5 Recommended AMHS Address Conversion Strategy

The recommended AMHS address conversion strategy is the means by which the general model represented in Figure 2 should be realized by States in the Asia and the Pacific Region. It is also applicable on a worldwide basis and has been presented and adopted by the ICAO ATNP as the general AMHS address conversion strategy¹. This strategy is made of the following elements:

- a) the establishment, by an appropriate ICAO body or entity, of an ICAO Registration and Publication process as a set of procedures for collecting and publishing AMHS address conversion information on a periodic basis (e.g. twice yearly). This will include:

¹ This will result in the corresponding guidance material being included in Edition 2 of ICAO Document 9739 (Comprehensive ATN Manual).

- i) the MD information included in the ICAO Registry of AMHS Management Domains, i.e. the MD identifier and the corresponding ICAO State/territory two letter identifier, together with the specification of the type of implemented addressing scheme (XF or CAAS).
 - ii) for those MDs having implemented the CAAS, the mapping information providing the organization-name address attribute for each ICAO location indicator;
- b) A Distributed Address Publishing Service (APS), based on ATN Directory Services, that allows publication of real-time AMHS address conversion information. This is to be implemented at the earliest opportunity upon ATSOs initiative, with the following principles:
- i) use of the directory scheme;
 - ii) initial population of the Directory Information Base with the information distributed through the ICAO Registration and Publication process;
 - iii) implementation of a single Directory System Agent (DSA) per ATSO to hold the MD Registry sub-tree, the world-wide ATSO information distributed through the ICAO Registration and Publication process, and the local AMHS MD address conversion information sub-tree; and
- c) in co-existence with the use of Address Mapping Tables (AMT) directly derived from the information published through the ICAO Registration and Publication process, for ATSOs that choose to defer the implementation of ATN Directory Services.

As a local implementation matter, ATSOs that envisage implementation of Directory Services for the purpose of the Distributed address publication service (APS) at the same time as they implement AMHS, should also consider the use of directory solutions as a technical option for the gateway's Address Mapping Tables (AMT).

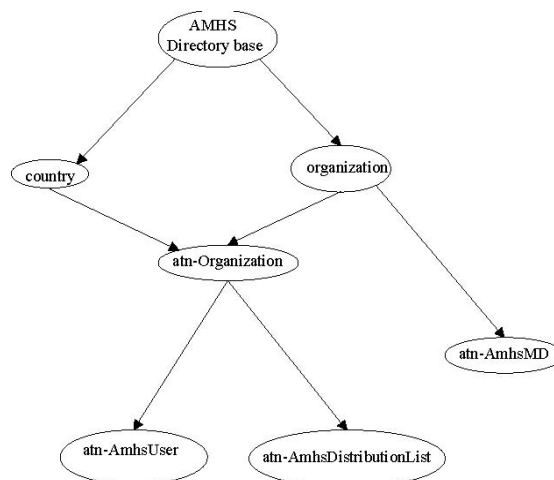


Figure 2: DIT structure for AMHS address conversion

3.2.8.6 Regional Provisions

The strategy above is complemented by the following transitional provisions which may apply regionally.

In case the first element in the above strategy is not implemented by ICAO in a timeframe compatible with early AMHS implementations, an equivalent process may be set up on an ad-hoc basis among ATSOs forming an AMHS island. This is particularly applicable to any countries ATSOs being early AMHS implementers.

In case of ATSOs implementing the second element in the above strategy that initially prefer to group together for the implementation of a single ICAO Regional DSA, the following should apply:

- the MD Registry sub-tree,
- a local AMHS MD ATSOs information sub-tree for each of the ATSOs in the group; and
- the world-wide ATSOs information distributed through the ICAO Registration and Publication process.

The Regional DSA thereby becomes an aggregation of the local DSAs envisaged in the principle strategy.

In the Asia and the Pacific Region, the creation of an Offline Management Centre is recommended to consolidate, co-ordinate and distribute AMHS user address changes across the Region. This Offline Management Centre should implement such a Regional DSA in support of its address management activities.

3.3 AMHS router topology

3.3.1 OSI Model for ATN Router

This section addresses the lower three layers of the OSI seven-layer model for the ATN Ground-Ground (G/G) routers in the Asia/Pacific regional ATN network. The three layers are Network, Data Link and Physical layer.

The ATN uses the ISO/IEC8473 Connectionless Network Protocol (CLNP) as the network protocol. Data are transferred in the CLNP Protocol Data Units (PDUs) over sub-networks such as ISO/IEC 8802 Local Area Network (LAN) and ISO/IEC 8208 ("X.25") point-to-point connections or packet switched networks. ATN routers bridge these sub-networks together to form an integrated ATN network, relaying data packets between LAN and WAN, and WAN and WAN.

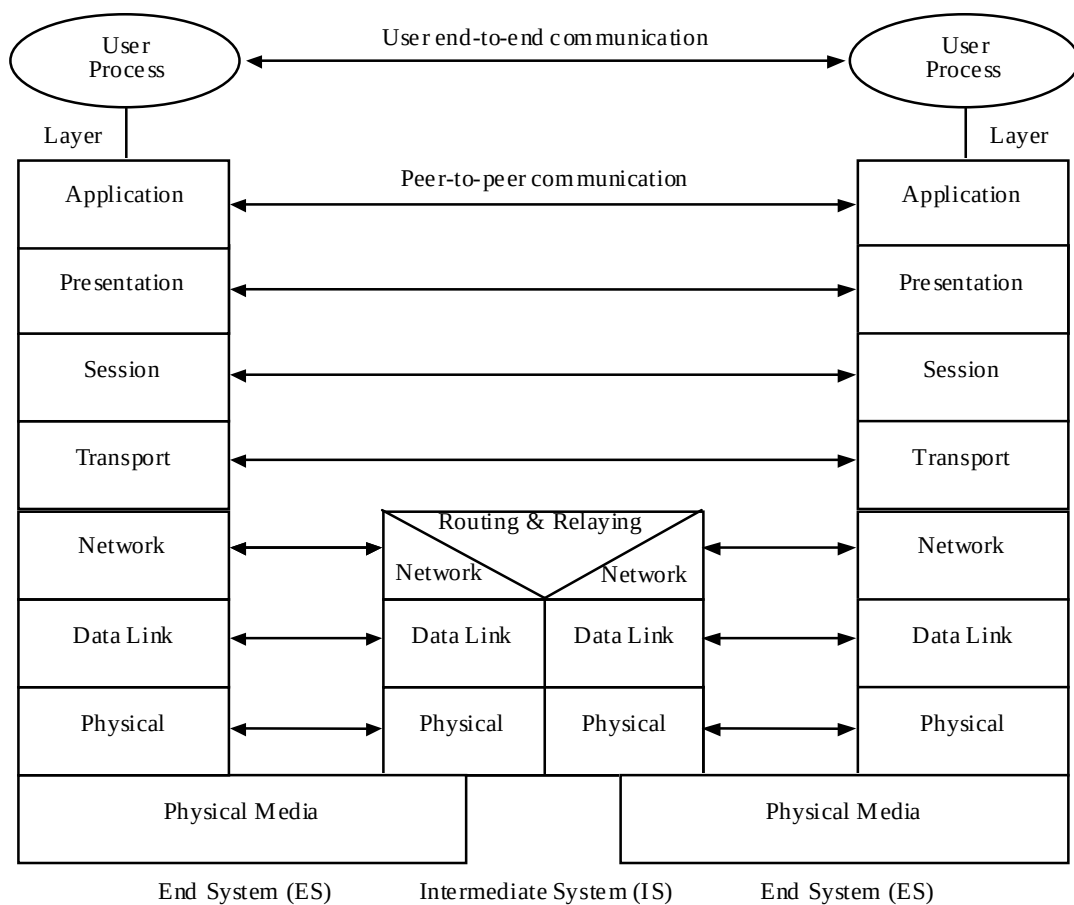


Figure 3: Open System Interconnection reference model

a. Network Layer

The network layer includes three sub-layers:

Sub-network Independent Function (SNICF)

The SNICF **shall** include the following routing and routed protocol:

1. ISO/IEC 10747 — the Inter-Domain Routing Protocol (IDRP); and
2. ISO/IEC 8473-1 — the Connectionless Network Protocol (CLNP).

The SNICF may support the following two optional routing protocols:

1. ISO/IEC 9542 — the End-System to Intermediate-System (ES-IS) protocol;
and
2. ISO/IEC 10589 — the Intermediate-System to Intermediate-System (IS-IS)
Intra-domain routing information exchange protocol.

Sub-network Dependent Convergence Function (SND CF)

The proper SND CF **shall** be implemented for underlying sub-network(s). The most commonly implemented SND CFs are the following:

1. ISO/IEC 8473-2 — Sub-network Dependent Convergence Function (SND CF) for Local Area Network (LAN); and
2. ISO/IEC 8473-3 — Sub-network Dependent Convergence Function (SND CF) for X.25 network.

Sub-network Sub-layer

The sub-network sub-layer is determined by the underlying sub-network. When the data are communicated over X.25 sub-network, the sub-network **shall** include X.25 Packet Layer Protocol (PLP) as specified in ISO/IEC 8208.

b. Data Link Layer

The ATN G/G router Data Link Layer for use within States is a local matter and could be X.25, LAN, etc.

The Data Link Layer used between States is subject to bilateral agreement. To ensure regional interoperability, however, the data link layer requirements for ATN routers that connect to the Asia/Pacific ATN regional network are specified in the Asia/Pacific regional ATN router ICD.

c. Physical Layer

The ATN G/G router Physical Layer is a local or bilateral matter and could use the Physical Layer of X.25, LAN, etc.

3.3.2 Routing and Routed Protocols

Class 4 routers support dynamic routing using the following routing protocols:

1) End system to Intermediate System (ES-IS) routing protocol;

According to ICAO Doc 9705, the ES-IS routing protocol is an optional protocol for ATN G/G routers. However, if ES-IS is supported, it is recommended that to ensure interoperability with End Systems, ATN G/G routers **should** comply with the requirements of ISO/IEC 9542 (ES-IS).

2) Intermediate System to Intermediate System (IS-IS) routing protocol; and

According to ICAO Doc 9705, the IS-IS routing protocol is an optional protocol for ATN G/G routers. However, if IS-IS is supported, it is recommended that to ensure interoperability with IS routers, ATN G/G routers should comply with the requirements of ISO/IEC 10589 (IS-IS).

3) Inter-domain Routing Protocol (IDRP).

The ATN G/G router shall comply with the requirements in ISO/IEC 10747 (IDRP), section 5.8.3 of ICAO Doc 9705, and the IDRP APRLs specified in the Asia/Pacific regional Ground/Ground router ICD.

4) Connectionless Network Protocol (CLNP)

The ATN G/G router shall comply with the requirements in ISO/IEC 8374-1, sections 5.6.2 and 5.6.3 of ICAO Doc 9705, and the CLNP APRLs specified in the Asia/Pacific regional Ground/Ground router ICD.

4 AMHS Protocol Scenarios

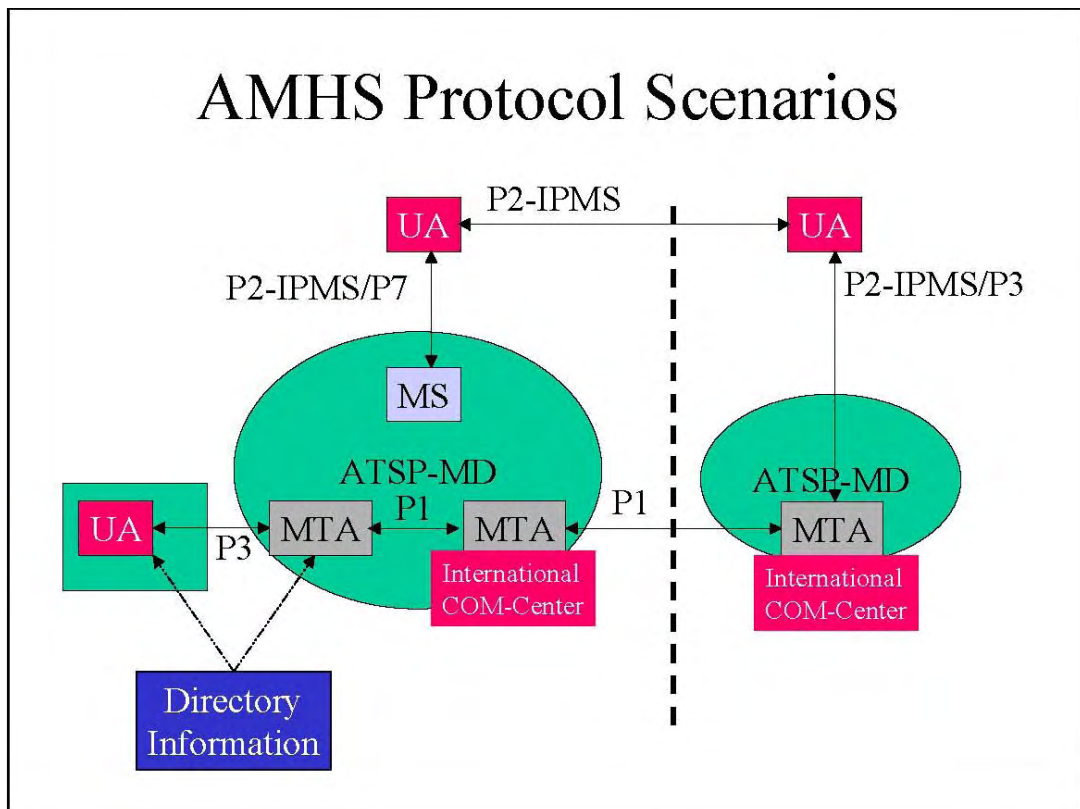


Figure 4: AMHS Systems and interconnecting Protocols

4.1 Applicable Profile

The Profile applies to the following AMHS system components:

- a) UA - User Agents
- b) MTA - Message Transfer Agents
- c) MS - Message Stores

The Profile applies to the following AMHS protocols:

- a) P1 - Message Transfer
- b) P2 - IPM Content
- c) P3 - Message Submission/Delivery
- d) P7 - Message Retrieval

The Profile specifies a profile of ATS Message Handling Service conformance called the Asia and the Pacific-AMHS Profile. It is based on the requirements of following:

- a) The Basic ATS Message Handling Service (Bas), introduced in the Doc. 9705 Ed. 3, para. 3.1.1 Note 2;
- b) A number of further Functional Groups and options selected from the Extended ATS Message Handling Service (Ext), introduced in the Doc. 9705 Ed.3, para 3.1.1 Note 2;

The resulting scope is sufficient to ensure inter-State message interchange using AMHS according to the Basic AMHS requirements stated in Doc. 9705, which covers Basic Message Transfer Capabilities, Distribution Lists, appropriate message size capability and Legal Recording.

Security requirements are not a mandatory part of the Asia and the Pacific-ATSMHS Profile. However, the Profile mandates IP address validation and the protocol includes system identification following transport connection establishment. It must be pointed out that certain Messaging Application Security functions are also mandated in the MHS.

4.2 Use of the Directory

Use of Directory is not mandated in the Profile due to the following reasons:

- There are other ways to implement the distribution of the necessary directory information which are viable at least in the early phases of AMHS implementation;
- Some States will not implement the directory (nor access it) in the first Implementation of AMHS. Some of the reasons for this are that they want to implement AMHS first before taking the next step to the Directory. Also, some currently available AMHS products do not support access to the Directory;

- Some States foresee that Directory Access as specified in Doc. 9705 using X.500 DAP is too costly in terms of software purchase, and they would like to be able to use LDAP (a more cost effective RFC-based equivalent). However, there are no currently available LDAP schema standards covering some of the ATN Directory-specific requirements (and some aspects of X.400 support). There are also no suitable standard LDAP products available;
- In some cases, it is not quite clear what elements of the ATN-Directory Schema are required to support different AMHS functions (e.g. in terms of directory information). These issues need to be resolved by further guidance material on the use of the ATN/AMHS Directory by the ACP. Currently, work is ongoing to fulfill this requirement.

5 System implementation -Guidelines for system requirements

5.1 Introduction

- 5.1.1. This section is intended to deal with technical and operational requirements for a COM system replacing the AFTN/X.25 system by an AMHS or adding the ATSMHS capability. As indicated by its title, this section covers guidelines for requirements not specified in the AMHS SARPs, but considered by the Group important enough for being included in a Call For Tender for the procurement of an AMHS system.
- 5.1.2. The main input of this section was a subset of the specifications of an actual Call For Tender issued by one of the Group members, adapted and modified in order to have a 'template' able to be used by any ATSO who intends to procure an AMHS system.
- 5.1.3. The section covers technical and operational requirements like:
- General facilities
 - Addressing - mapping table facilities
 - Queue management facilities
 - Message repetition facilities
 - Tracing facilities
 - Sizing
 - Availability and reliability
- 5.1.4. For such a COM system in the following paragraphs the term "**AMHS System**" will be used.
- 5.1.5. Due to the character of this section (as guidelines for system requirements) the Term "**should**" is used. In a specific Call For Tender this term can be replaced by shall.

5.2 General requirements

- 5.2.1. The AMHS System should implement the ATSMHS and AFTN/AMHS Gateway facilities in accordance to the specifications defined in the latest approved ATN SARPs for Basic Services, but supporting AFTN messages with a message length up to 64 Kbytes.
- Note. – This requirement is not covered by the SARPs, which mandate support of Standard AFTN message length only.*
- 5.2.2. The AMHS System should support several simultaneous associations with an MTA partner (at least, up to 5).
- 5.2.3. The AMHS System should support simultaneous associations with several MTA partners (one or several associations with each MTA partner) with the same or different “transport” protocols (e.g. TCP/IP to be used within EUR, ATN between ICAO Regions).

- 5.2.4. The AMHS System should support the total number of simultaneous Associations (sum of all associations) without any restrictions caused by inherent limitations of the system (memory, interfaces, etc).
- 5.2.5. The AMHS System should allow control of establishment of associations with MTA partners via on-line operator commands; i.e., it should be able to:
- Prevent/allow the establishment of associations with a given MTA partner by AMHS System (local MTA), by MTA partner only or by both partners.
 - Prevent/allow the establishment of associations with all configured MTA partners by AMHS System (local MTA), by all MTA partners only or by all partners.
 - Force the termination of associations already established with a given MTA partner.
 - Force the termination of associations already established with all configured MTA partners.

Note. – The number of actual simultaneous associations to be supported will depend on:

- *the target 'logical' AMHS network topology: for example each centre establishes direct associations with all the other centres or each centres establishes associations with adjacent centres only (as in AFTN);*
 - *whether permanent or dynamic connections will be established. Such distinction is only applicable in case there is no requirement for continuous traffic exchange.*
- 5.2.6. The AMHS System should implement MTA queues. These queues will keep the AMHS messages that:
- a) either are pending to be sent; or
 - b) have been transmitted but for which a delivery report is expected.

Note 1. – The queue referred to in " item a" should be implemented in the MTA.

Note 2. – The queue of messages for which a DR is expected should be implemented in the User Agents and MTCUs of the AFTN/AMHS gateways. The reaction of an AMHS System in case of loss of a DR should be fixed (implementation matter): E.g., would it have to resend the message after timeout? How many attempts to resend the message should be made? A DR or NDR is addressed to the originator of the message, therefore it should be left to the originator to react upon non-arrival of a DR as it is his task to react upon reception of a NDR. If the originator is an indirect (AFTN) user, the AFTN/AMHS gateway has to perform this task on his behalf. Furthermore, a report may take another route than the message it refers to, that means it does not necessarily pass through the same MTAs as the original message.

- 5.2.7. There should be a logical MTA queue per configured MTA partner. Management of these queues is specified in section 5.4).
- 5.2.8. The configuration of an MTA partner (via on-line commands) should provide flexibility for each of its parameters. For example:

- a) It should be possible to configure the “transport” protocol (e.g. ATN, TCP/IP, TP0/X.25, TP4/X.25) to be used per each MTA partner.
- b) In case of selection of TP4/X.25, it should be allowed to configure at least two local X.25 attachments to be used for the connections, several calling – called addresses to be used for initiating a call or acceptance of an incoming call, etc.
- c) It should be possible to configure the maximum number of simultaneous associations with each MTA partner.
- d) It should be possible to configure whether the associations have to be left permanently established or whether they have to be established and closed depending on traffic.

5.2.9. The AMHS System should allow configuration of all profile items if possible.

5.2.10. The AMHS System should allow configuration of the following profile items, at least:

- a) Mapping between AFTN priorities and AMHS Message Transfer Envelope priorities.
- b) Values of “rn” and “rnr” in the notification-requests element in the recipient fields in the IPM heading. These values should depend on the value of the AFTN priority.

Note 1. – Both functions should be implemented in the UAs and MTCUs of the AFTN/AMHS gateway since the MTA does not deal with the ATS Message Priority (or AFTN priority) which is contained in the ATS Message Header as part of the IPM body.

Note 2. – The SARPs specify the values of these profile items. It is considered that the implementation should allow the possibility to change them just by configuration in case operational experience recommended other settings. The processing is implementation matter.

5.3 Addressing – mapping tables requirements

5.3.1. The AMHS System should support the CAAS (see section 3.2)

5.3.2. The AMHS System should process and manage AMHS messages received with the O/R name in the XF Addressing Scheme also, even if the ATSO has chosen the CAAS for its internal users.

5.3.3. The AMHS System should provide mechanisms to import mapping tables needed in the AFTN/AMHS Gateway. The tables to be imported will be downloadable from the AMC system.

5.3.4. The implemented facilities in the AFTN/AMHS Gateway which map an AFTN address to an O/R name should be flexible enough to accommodate different O/R structures (Addressing Schemes) and use the minimum number of configuration / lookup tables with the minimum number of entries. As an example for the implementation of the mapping of an AFTN address to an O/R name, the following information should be entered in configuration tables:

- i) Attributes and associated values that are fixed for each State. e.g. in the case of States using the address scheme described in section 3.2 the attributes and associated values to be entered should be Country, ADMD and PRMD. Each entry will be indexed by the ICAO routing area or State/territory identifying letters (1 or 2 first characters of the AFTN address).
- ii) Attributes whose values can be determined directly from the AFTN address. e.g. in the case of States using the CAAS described in section 3.2, the Organization Unit 1 attribute (first to fourth characters in the AFTN address) and the Common Name (all characters in the AFTN address) should be declared here for them.
- iii) Attributes whose values depend on a mapping table. For each such attribute for each State, the following should be specified: the name of the mapping table and the subset of the AFTN address (e.g. one to four first characters, the complete AFTN address, wild characters could be used to define the subset...) that gives the index to the mapping table. The mapping table itself should also be provided. e.g. in the case of countries using the CAAS address scheme described in section 3.2.4.2, the value for the Organization attribute should be defined this way.

5.3.5. The possibility to use a directory should also be contemplated, even if this is not part of the Basic Services.

5.4 Queue management requirements

5.4.1. The AMHS System should provide, in addition to a pure diversion facility of outgoing queues, a reprocessing of messages in X.400 (outgoing) queues in case of longer outages of adjacent MTAs (non-reachability).

Note. – Such reprocessing facilities will be very important during the time period when both AMHS and AFTN/X.25 centres coexist in the Asia and the Pacific Region.

5.4.2. Two types of reprocessing should be envisaged at:

- a) the pure X.400 level
- b) the AFTN level (in the case of AFTN/AMHS Gateways)

5.4.3. Reprocessing at the pure X.400 level

5.4.3.1. The reprocessing at pure X.400 level should allow :

- a) to extract messages waiting in an X.400 queue from this queue,
- b) to process these messages again by the X.400 routing software and
- c) to route according to possible new or temporarily modified X.400 routing tables.

5.4.3.2. Such a mechanism would allow to extract the messages from the queue associated to a non reachable MTA. The messages could be routed through another centre (MTA) and forwarded through the alternate route only for those recipient addresses for which alternate routes have been activated. For all other recipients addresses the messages remain in the

queue. This kind of processing prevents a general forwarding of messages to other centres (MTAs) containing recipient addresses for which rerouting is not intended.

- 5.4.3.3. The reprocessing at the pure X.400 level should be present in the ATS Message Servers, in AFTN/AMHS Gateways.

5.4.4. Reprocessing at the AFTN level

- 5.4.4.1. The reprocessing at AFTN level should allow:

- a) to extract messages waiting in an X.400 queue,
- b) to re-process them by the AFTN layer, and
- c) to route them according to the current AFTN, X.25 and X.400 routing tables respecting the updated route availability information (predefined alternate routing).

This reprocessing would solve the problem of non-reachability due to outages, in a heterogeneous AFTN/ X.25/AMHS environment.

- 5.4.4.2. An X.400 queue can contain messages, reports and probes. The AFTN reprocessing function should only concern the messages. These messages can be of different 'types', e.g.
- i) messages from AFTN/AMHS gateways,
 - ii) messages from X.25-OPMET/AMHS gateways,
 - iii) 'pure' UA to UA exchanges, etc.

All these messages will be IPM messages, so there is no way to distinguish them at the X.400 (envelope) protocol level.

- 5.4.4.3. The reprocessing should be restricted to messages generated by an AFTN/AMHS gateway.

5.5 Message repetition requirements

- 5.5.1. The AMHS System should provide powerful message repetition facilities in the AFTN, X.25 and AMHS subsystems implementation.
- 5.5.2. The repetition facilities should be able to repeat messages as they were originally transmitted i.e. sent to all recipients following the same transmission paths.
- 5.5.3. Additionally, the repetition facilities should be able to specify (with the use of wildcards) 'detailed' or 'generic' destinations. Such destinations can be an AFTN address, an O/R name, all AFTN addresses mapped to a given Ax, all O/R names of a given PRMD, etc.
- 5.5.4. The AMHS System should find all the messages that were transmitted to such specified 'generic' destinations within a specified time interval and retransmit them only to pending destinations and following the current routing. To avoid a transmission to other destinations originally contained in the message the addresses not matched by the 'generic' destination should be suppressed (address stripping).

5.6 Tracing facilities requirements

- 5.6.1. The AMHS System should provide a facility to allow generation of X.400 probes.
- 5.6.2. The user interface of the facility should allow entering of the priority, the O/R name of the originator / destinations and the message length.

- 5.6.3. The AMHS System should send the reports regarding the probes (delivery, non-delivery) to a configurable instance (e.g. the rejection queue).

Note. – This requirement relates to a user interface requirement. The user should get some notification when the delivery report related to the probe has been received. It is an implementation matter to decide whether this is performed just by allocating a fixed originator O/R name to one of the queues of the system or by another way.

The contents of such reports should be decoded and presented in a 'human' readable and understandable format.

- 5.6.4. The AMHS System should provide association-tracing facilities to monitor in real time the establishment, interruption and finalization of associations related to adjacent MTAs.

5.7 Sizing requirements

The sizing of the AMHS System operational platform should support the traffic during peak hour situations with:

- a) Average peak hour total CPU usage at 30% maximum.
- b) Communication adapters loaded at a maximum 30% of their real bandwidth capacity (not the theoretical one) and excluding the redundancy needs.

Note. – The previous values have to be reconsidered by each ATSO depending on the expected lifetime of the AMHS System. As e.g., if the lifetime is expected to be 10 years and the traffic estimates for the peak hour relate to the end of the lifetime, the usage requirements for the CPU and the communication adapters should be greater than 30% (if not, the purchased system will be oversized during quite a number of years)

- c) Processing time of a message (High QoS flow type class, see section 3.1) at least less than 1.5 seconds. The processing time is defined as the difference between the moment the latest character of the message enters into the AMHS System and the moment the first character of the message is sent out. This applies for all implemented in / out protocol combinations. For messages of other flow types, the processing time should be less than 3 seconds.

Note. – This value, especially for AMHS, has significant implications in the platform sizing and total network transit time. If the value is too low, a very powerful platform is required; If the value is too high, it could introduce a significant delay in the overall message transmission (specially if the other centres also have high values).

- d) Response time to configuration / management on-line commands less than 3 seconds. This response time is related to request from a management position for actions which do not require a query / browsing of a log (e.g. close a PVC, create an Ax, etc).
- e) At least sufficient disk space remaining available after:

1. all the standard and specific developed software versions (including the possibility of more than one software versions and two configurations per version) are present on disk,
2. all logs and archive folders corresponding to the number of days to be kept on-line in the system are present on disk.

Note.1 – The precise number of days will depend on the particular policy of each ATSO to comply with the ICAO Legal Requirements

If its policy indicates that all the data has to be kept on the AMHS System, the system should support at least 30 days. If the policy indicates that the data are saved for such purpose somewhere else (e.g. in another system, in an external media like CD-ROM, DAT, cartridge, etc), data concerning fewer days needs to be kept on-line (e.g. three days, one week, etc.).

Note.2 – As for the CPU and communication adapter usage, the value for disk Space shall be reconsidered by each ATSO depending on the expected lifetime of the AMHS System and the traffic estimates related to.

5.8 Availability and reliability requirements

- 5.8.1. The AMHS System should operate 24 hours per day and 365 days per year.

Note. – The values provided below should be considered as 'minimum' requirements. Each ATSO should reconsider them according to its own policy and internal SLAs with its internal users.

- 5.8.2. Interruptions for system maintenance and installation should be limited to the Strict minimum and should be less than 60 minutes.
- 5.8.3. After power is switched on, the AMHS System should be fully operational after a maximum of 15 minutes.
- 5.8.4. The AMHS System should auto monitor:
- the state of its application processes.
 - the state of its system processes.
 - the state of its system components (hardware).
- 5.8.5. The AMHS System should generate an SNMP MIB of the states monitored (see above).
- 5.8.6. The AMHS System should automatically try to recover from failure conditions in its application processes. If it is not possible to recover without impacting the service, the AMHS System should terminate all its application processes in an orderly manner and restart them afterwards automatically.
- 5.8.7. The AMHS System should allow an operator to:
- a) Stop the AMHS application gracefully (with automatic restart).
 - b) Stop the AMHS application gracefully (with no automatic restart).

- c) Force the AMHS application to stop (with no automatic restart).
 - d) Start the AMHS application with message recovery (messages that were in queue when the system was stopped are processed and forwarded).
 - e) Start the AMHS application without message recovery (messages that were in queue when the system was stopped are discarded).
- 5.8.8. The AMHS System should lose no message that has been acknowledged by it (according to the respective messaging protocol), unless an operator explicitly requests to drop the messages.
- 5.8.9. The AMHS System should lose no message because of its load.
- 5.8.10. In case of a switchover (cluster, master/standby) configuration, the following requirements apply:
- a) After detection of failure of the primary system unit or after an operator command, the switchover process should last less than five minutes. The duration of the switchover is counted as the time from the failure detection (or operator command) until the time the AMHS restarts forwarding messages again (assuming there are messages in queue or there are new incoming messages).
 - b) The time needed for the standby unit to detect failure of the primary one should be less than three minutes.
 - c) The switchover process should be completely automatically without requiring any plugging / unplugging of any type of cables (communications, disks ...). A matrix switch action (if a matrix switch is proposed) is not considered as a cable plug / unplug.
- 5.8.11. Any period of time longer than one minute, during which the AMHS System does not perform message switching (in a total or partial manner) due to software or hardware problems, should be considered as an interruption of service.
- 5.8.12. An interruption of service of a AMHS System should be less than 10 minutes when the recovery is automatic. The duration of an interruption is calculated as the time from the moment the last received message was forwarded until the moment the AMHS System starts forwarding messages again (assuming there are messages in queue or there are new incoming messages).
- 5.8.13. There should be no more than one interruption of service without automatic recovery in a sliding window of six months.
- 5.8.14. There should be no more than one interruption of service with automatic recovery per day.
- 5.8.15. There should be no more than two interruptions of service with automatic recovery per month.
- 5.8.16. There should be no more than three interruptions of service with automatic recovery in a sliding window of three months.
- 5.8.17. The MTBF of the AMHS System hardware should be higher than 52 weeks.

6 Requirements for statistics

6.1.1 The AMHS System should monitor and produce statistics per direct MTA partner as follows, where the term “data messages” includes all X.400 P1 information objects, i.e. messages, probes and reports:

- a) Number of data messages transmitted
- b) Average size of the data messages transmitted
- c) Maximum size of the data messages transmitted
- d) Average number of destination addresses per message transmitted
- e) Number of data messages received
- f) Average size of the data messages received
- g) Maximum size of the data messages received
- h) Average transfer time
- i) Number of delivery reports transmitted (a subset of item a)
- j) Number of non-delivery reports transmitted (a subset of item a)
- k) Number of delivery reports received (a subset of item e)
- l) Number of non-delivery reports received (a subset of item e)
- m) Minimum size of data messages received
- n) Minimum size of data messages transmitted
- o) Maximum, mean and minimum response time
- p) Number of recipients processed
- q) Number of messages deferred (the criterion for a deferred message should be specified by a configurable system parameter)
- r) Number of messages redirected
- s) Number of messages rejected
- t) Number of loops detected

6.1.2 The AMHS System and its management tools should be enable to monitor and produce statistics per direct MTA partner, related to traffic volume and quality of service at an overall system level, as follows:

- a) Overall traffic volume
- b) Maximum outage duration of association between MTAs (if any)
- c) Cumulated outage duration of association between MTAs (if any)

6.1.3 Additionally the AMHS System should produce the information specified in 6.1.1 and 6.1.2 for all partner MTAs as a total.

6.1.4 The AMHS System should be able to generate the above statistics in at least the following intervals: 1 day interval, 1 hour interval, 30 minutes interval or better.

6.1.5 The AMHS System should be flexible in configuring other intervals for application statistics generation.

6.1.6 The AMHS System should be flexible in generating statistics at a more detailed level, as e.g., MTA route entries, particular O/R attributes, individual O/R names (to be discussed).

Note. – Each ATSO may consider what requirements on statistics are put on the AMHS System in accordance with its requirements (national and international) and its policy for statistics production. e.g., there can be ATSOs which transfer the traffic logs to another system which will produce all required statistics; in such a case, the AMHS System may be

relieved of too many statistics requirements. If an ATSO does not have such other system, the AMHS System should produce all statistics needed

The AMHS System should be able to export specific statistic files on a monthly basis. Such a statistic file should contain daily as well as peak hour statistical data in a standard format, covering certain items in 6.1.1 and 6.1.2, because of their specific international relevance.

7 Tests and validation of AMHS systems

7.1 Objective

Experience has shown that, although it is claimed that systems have been implemented according to the one set of protocol specifications, they are often not capable of inter-working. This is due to errors in implementation or to different interpretations of the specifications (SARPs). Testing and validation of systems according to the same set of principles, aims at the detection of such errors and the prevention of incompatibility instances.

The primary objective of this chapter is to formulate recommendations for testing the ability of a given AMHS implementation to function as required at the level of an International Communication Centre within the AFTN/ X.25/AMHS network environment.

This chapter provides general information on the AMHS testing concept. The actual testing methodologies, configurations and procedures are defined in Annex B, Annex C, Annex D, Annex E and Annex F. In these Annexes, tests are described in sufficient detail to give an appreciation of the variety of functions that are covered, the facilities required and the expected results.

7.2 General Principles

The creation of standards for testing is subject to consideration by a number of standardization bodies concerned with open systems (e.g. ISO, ITU-T).

In these standards, *conformance testing* is prescribed for testing a protocol implementation (IUT) with respect to its specification.

If conformance testing could be done in a complete and correct manner, then two different implementations that passed the conformance test would be interoperable. In practice, conformance testing does not necessarily reach the intended point of completeness and correctness. Consequently, conformance testing may be followed by *interoperability testing* to determine whether two or more implementations will produce the expected behaviour under actual operating conditions.

In a more detailed analysis of the objectives of conformance and interoperability testing the following distinctions can be made:

- a) The primary objective of interoperability testing is to confirm the end-to-end interoperability of two systems, which have both been developed to a common specification. Performance and load testing are possible, at least in principle.
- b) Conformance testing can be defined as the exhaustive testing of an IUT against the functions and procedures defined in an agreed standard. Performance and load testing are not usually part of conformance testing which is restricted to the “logic” of the protocol implementation.

Furthermore, two essential practical differences between conformance and interoperability testing should be pointed out:

- a) Incorrect protocol behavior. – Conformance testing allows “provoking” of the IUT, through incorrect protocol behavior, in order to study its stability.
- b) Interoperability testing provides only limited possibilities due to (normally) correct protocol implementations in real systems.
- c) Distribution of test locations. – Conformance testing can be performed locally between IUT and a conformance testing equipment. Interoperability testing is normally distributed over at least two remote locations, therefore requiring more coordination effort.

Figure 5, below depicts the principal differences in test arrangements for interoperability and conformance testing.

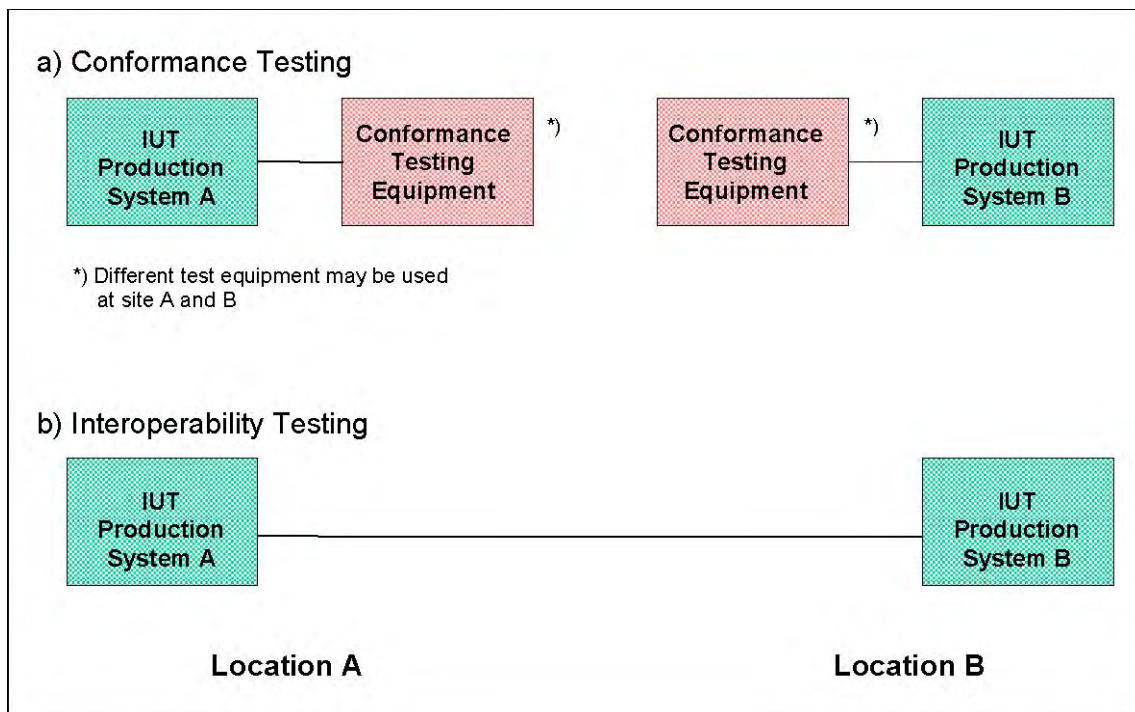


Figure 5: Principal test arrangements for conformance and interoperability testing

7.3 AMHS testing concept

7.3.1 Testing strategy

AMHS system implementations consist of protocol layers according to the principles of the Reference Model for Open Systems Interconnection. The AMHS functions to be tested reside in the application layer of the ISO/OSI reference model. The underlying layers provide supporting communication services, however they are not primarily subject to testing.

Figure 6 provides a generic functional presentation of an AMHS implementation under test.

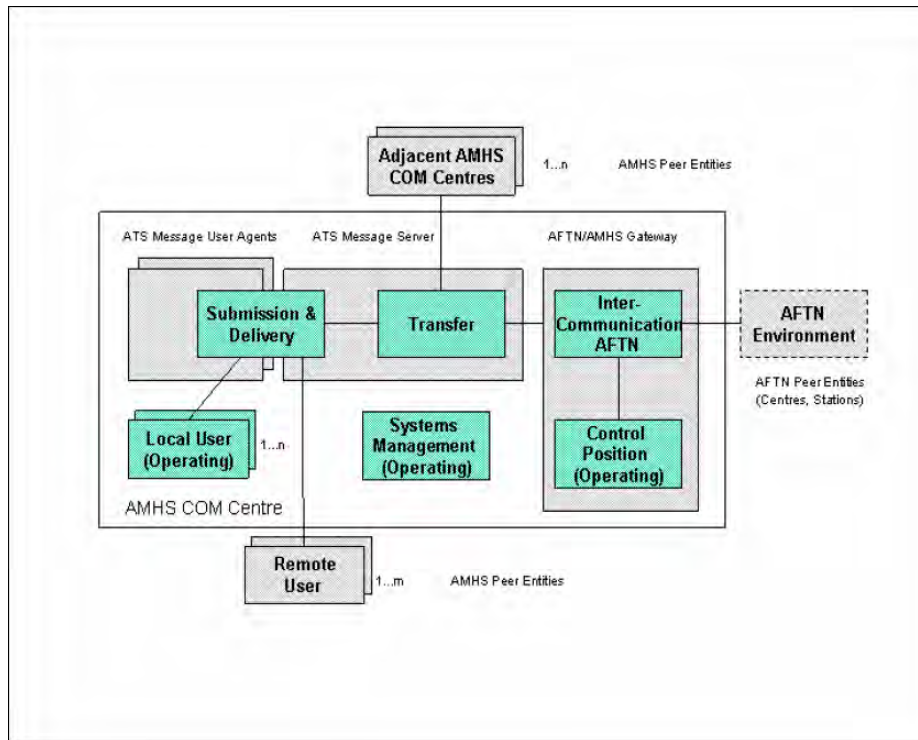


Figure 6: Functional view of an AMHS IUT

7.3.2 AMHS testing phases

7.3.2.1 AMHS Conformance testing

For the purposes of AMHS, *conformance testing* is considered mandatory and shall be performed in parallel with or after the acceptance testing of a new system.

The new system is tested as a *black box*, meaning that that required features are verified by observation of the external *behavior* of the IUT upon stimulation with well defined input events.

A *conformance testing equipment*, called the *AMHS test tool*, is used typically for the production of such input events and the monitoring of the resulting outputs from the IUT. In case such an AMHS test tool or reference implementation is *not* available, a test environment could be configured by using functional components of the IUT itself. Testing in such an environment may be seen as consistency testing rather than conformance testing.

The main AMHS functional areas covered by conformance testing are:

- Transfer of messages probes and reports
- Submission of messages and probes / delivery of messages and reports
- Intercommunication with AFTN
- Naming and addressing
- Parameters
- System management functions.

7.3.2.2 AMHS Interoperability testing

After successful completion of conformance testing, *interoperability testing* is recommended, particularly between AMHS implementations of different manufacturers.

As a first step to interoperability testing the interconnection between pairs of systems should be established and checked.

Then, at the bilateral level, the following functional areas should be covered:

- Submission, Transfer and Delivery Operations (AMHS to AMHS)
- Gateway operations (AFTN to AMHS)
- Gateway operations (AMHS to AFTN)
- Gateway operations (AFTN to AMHS to AFTN)
- Gateway operations – special case scenarios
- Stress traffic situations
- Submission/Transfer/Delivery and Relay operations
- Test of special situations

At the multilateral level, interoperability testing involves more than two organizations, interchanging normal and exception messages and generating specific reactions of their systems.

7.3.2.3 AMHS Pre-operational testing

Before going into operation, pre-operational testing should be carried out between the AMHS systems concerned, within the operational network environment and using duplicated operational traffic.

The configuration details and the actual sub-sets of traffic to be used, have to be co-ordinated between the test partners. In any case, the operational traffic selected for this purpose should be traffic under the responsibility of the Communication Centres under test.

The AMHS relation between the two systems is considered operational, if the exchange of the total of operational traffic between them (or a subset of that), is performed by means of AMHS only. For this operational traffic no other transmission means (AFTN or X.25) is used.

8 References

ICAO Documentation

- [1] Aeronautical Telecommunications, Annex 10, Volume II and Volume III
- [2] Manual of technical provisions for the Aeronautical Telecommunication Network (ATN), Doc9705, Sub-Volume III: ATS Message Handling Services (AMHS).
- [3] Comprehensive ATN Manual (CAMAL), Doc 9739, Part III
- [4] Location Indicators, Doc 7910
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ANNEX A

Guidelines to QOS (Quality of Service)

ANNEX A

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates – change of document version number	all

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1 Scope

The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the ASIAPAC AMHS. To this end, the properties of the AMHS are considered from the outside of the network, i.e. at its boundary, without taking into account the way in which the service, as defined on its boundary, is provided from within the network.

The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

Numerical values for performance parameters are defined using the following input:

- anticipated location of message servers and gateways;
- analysis of existing and projected message flows in the ASIAPAC area based on presently available information;
- general design principles;
- user expertise.

As in most cases, in order to arrive at concrete values for the performance parameters, a number of assumptions and restrictions are made:

- QoS is not dependent on traffic volumes;
- QoS is measured between originator-recipient pairs;
- QoS is not geographically dependent;
- QoS is not dependent on time;
- QoS represents worst case performance;
- the underlying network should be sized to accommodate QoS;
- degree of corruption is not relevant to the Corruption QoS parameter;
- corruption is not dependent on message size;
- non reachability due to network causes is typically of the order of a few minutes (60per year);
- the bit error rate of an HDLC link is of the order 10^{-11} .

In dimensioning the AMHS only complete messages should be considered for the Following reasons:

- the message is the basic unit of data at the user interface;
- whole messages are stored and forwarded by MTAs in the network;

- in formulating performance requirements, transport or sub-network performance is not taken into account.

Of course, in dimensioning the network, it will be necessary to consider performance aspects of lower level infrastructure as well, but as a result of the user requirements formulated in this document and their impact on MTA performance.

Further, it is important to note that the specification of performance requirements is based on individual messages, independently of all other messages.

When considering message size, only the volume of user information is relevant since the user has no control (or only very limited control) over the data overhead involved in message handling.

Formulating performance requirements of a given user, taking into account the simultaneous use of the network by other users, does not appear to be feasible. However, it has to be recognised that, in a real world situation, the performance of the network for a given message certainly does depend on the presence of other messages currently being processed. The performance requirements specified here represent minimum or worst-case performance under the load conditions (Traffic Volume Requirements).

Types of performance parameters

There are two distinct groups of performance parameters to be considered in connection with the AMHS. Parameters not dependent on message volumes: These parameters describe the quality of service (QoS), which is available to each individual message considered by itself, e.g. transit time. They can be measured, i.e. they are the quantitative results of the way in which messages are handled by the network.

Message volumes: These parameters describe the volumes of messages, message sizes and their distribution geographically, as they could be generated by users of the network. The parameters could be measured in the user end systems but it is not realistic to measure them in the network.

QoS per individual message

QoS requirements have to be satisfied under worst possible/allowable traffic volumes and most unfavourable originator/recipient pairs within a specific network configuration. Consequently, QoS is formulated for each individual message, independently of other messages being handled by the network.

This choice has been made for the following reasons:

- it is difficult to imagine that users would accept a QoS which is dependent on the demands which other users place on the network at the same time;
- the network has to be dimensioned to handle the maximum message volumes, while performing sufficiently well;
- the QoS requirements represent "worst case" performance when maximum degradation through interaction with other traffic occurs.

It must be pointed out, that AMHS provides the facilities to send messages many orders of magnitude greater than AFTN, with attachments measured in Mb. Clearly transfer times for such messages will be considerably longer than for the short text messages exchanged in AFTN. It is, thus, necessary to qualify the statement that QoS is independent of message size by adding 'for messages containing similar information to that carried over the AFTN'. If a quantitative limit is required, this will be between 4Kb and 6Kb, being the equivalent size of an AFTN message including the AMHS header.

Independence of QoS on location and time

QoS for an originator/recipient pair is most likely dependent on the relative locations of the two end systems, i.e. whether messages are transmitted with more or less hops through MHS systems (MTAs etc.). However, for simplicity reasons and since QoS requirements are "worst case" requirements, they are stated independently of the location of a message server.

Furthermore, QoS requirements remain constant at all times and are not dependent on date and time of day.

The AMHS performance requirements for the AFTN/AMHS Gateways, could, by agreement, be deemed to apply to interfaces between AMHS functions and AFTN functions in Gateways, e.g. a boundary point consisting of an interface between an internal Message Store and an AFTN handler within a Gateway.

Dependence of QoS on the AMHS service used

It may be necessary to specify different QoS levels for the AMHS corresponding to different sets of services used, i.e. there may be different classes of messages with respect to QoS. The number of QoS levels should be kept small for simplicity and the way in which service parameters map a message to a QoS level must be simple.

The values of QoS provided by the AMHS are useful to the application designer in deciding which services to use and how they are used. For example, the degree of certainty that a message will reach its destination will determine whether AMHS acknowledgement services are used and in what way. Furthermore, the values of QoS are useful in designing higher-level protocols.

2 Specification of performance requirements

The specification and meaningful application of performance requirements is not a simple task. This sub-section outlines some of the difficulties involved and principles to be adopted.

Statistical significance

The way in which performance parameters are formulated is necessarily statistical in nature. This is due to the large number of factors, which affect the performance of the network, such as:

- the current network configuration;
- the current overall load of the network, i.e. the behaviour of all users considered as a whole; and
- the dynamic properties of network nodes and transmission systems.

The need for measurement

For the specification and application of performance requirements to be meaningful, there has to be a framework for measuring performance with respect to the performance parameters. Aspects of a measurement framework which have to be considered are:

- because of the non-deterministic nature of network performance, measurements need to involve large samples of messages, as described in the previous section;
- measurements must be made at different locations simultaneously;
- consistent decisions have to be made as to where measurements are performed, e.g. at service interfaces in MTAs, UAs etc.

Network aspects relevant to performance

The following list contains factors which can affect message handling performance:

- processing speed, limits the capacity due to the store and forward nature of message handling;
- the finite transmission capacity (line speed) of links between nodes, limits the network throughput;
- the transmission times across links, affects the message transit time since complete messages are stored and forwarded a number of times between originator and recipient;
- the efficiency of message queues;
- transmission line failures and errors are obvious sources of degraded performance;
- table configuration errors can have major negative effects on network performance;
- software failures, which are difficult to treat quantitatively.

In designing the network, the performance requirements (amongst other things) have to be translated into properties of individual network components such that overall requirements are satisfied. Of course other considerations such as policy, expandability, ease of maintenance etc. enter into the network design as well.

AMHS Quality of Service Requirements

For reasons of completeness, simplicity and relevance, a minimal set of parameters was selected out of the large range of possibilities for expressing performance properties, to form a suitable "frame of reference" for discussing the dynamic properties of the AISAPAC AMHS:

These parameters defined and described in the following sub-sections in more detail, are:

- Destination Non-Reachability;
- Maximum Transit Time;
- Message Corruption.

The selection of these three parameters has been made for the sake of:

- Completeness: all relevant performance aspects of AMHS are covered;
- Simplicity: the formulation of requirements is intentionally kept simple; and
- Relevance: no aspects are included which are not considered to be relevant.

If the performance of the AMHS is such that these parameters are exceeded, then the service is deemed to be of poor quality.

Destination Non-Reachability

Destination Non-Reachability is expressed with respect to pairs of addresses (originator / recipient). It is the probability that a message sent by the originator will not reach the recipient within the Maximum Transit Delay (as defined below).

The above definition shows that the parameters Destination Non-Reachability and maximum Transit Time (see below) are not independent of each other: their definitions are coupled. This is intentional. The philosophy behind this definition is that the value of a message to a person or an application receiving it is dependent on its timely receipt. It is assumed, for a given flow type, that all messages belonging to it have the same value of this parameter.

The definition of Destination Non-Reachability is independent of whether the long (or infinite) transit time for a message is reported to its originator or not. It is also independent of whether acknowledgement procedures within the AMHS or on an application level detect the long (or infinite) transit time or not.

Destination Non-Reachability includes the cases in which messages are “lost”, i.e. do not reach their destination in finite time. The probability of message loss must be negligible and this probability is included in the total probability of Destination Non-Reachability. However, there remains a need (for procurement purposes) to place a separate figure on this probability.

In keeping with the above rationale, it is required that the probability of message loss is, at most, one tenth of the probability of Destination Non-Reachability.

Maximum Transit Delay

The Maximum Transit Delay is the time within which a single message has to be transmitted through the network end-to-end so that its transmission is of value to the applications (users).

If this time is exceeded, the receipt of the message is, in principle, of no value to the application. If the non-receipt within this time is known to the application, then, presumably, error procedures, such as message retransmission, will be initiated.

The transit delay is the time taken by the network to make the message available to the Message Store associated with the message recipient (UA). Therefore the boundary points of the network may, in this context, be considered to be the MTAs connected to the UAs serving the originators/recipients. The boundary points can also be the MTA functionality within AFTN/AMHS Gateways.

It must be borne in mind, that the parameters Maximum Transit Delay and destination Non-Reachability only have significance when they are taken together.

Message Corruption

The third Quality of Service Parameter concerns message integrity and is called "Message Corruption". It is the probability that each 1,000 octet content block of a message which arrives at its destination, has been corrupted in any way. The definition of Message Corruption applies only to messages which reach their recipients within the Maximum Transit Delay.

"Corruption" means a deviation, end-to-end, of the content of the received message from the content of the original message. The "content" is also deemed to include parameters, such as originator address, which are delivered together with the message. Corruption can also result from unauthorised changes to a message.

Since the volume unit for defining Message Corruption is large (1,000 octets), the requirement is almost independent of the size of (current) messages. This simplification is based on the assumption that corruption is due to unforeseen system malfunctioning, e.g. faulty software.

The corruption of messages due to such causes is not likely to be dependent on the size of messages. (This is true today, but the upcoming use of ADEXP messages-with message lengths up to 10k octets-has to be mentioned, as well as the potential forthcoming applications interchanging messages with binary body parts).

The probability of corruption due to other parameters such as system load, queue sizes, transmission errors etc. is almost negligible.

It is estimated, that the volume dependent non-detected bit error probability for a 1000 octet message traversing the AMHS and involving 5 links and 5 different systems (MTAs, UAs, MSs) is of the order of one bit in 10^5 or less. This justifies the (almost) volume-independent character of the Message Corruption parameter.

QoS Flow Type Classes

Different types of information exchange, called Flow Types here, place different QoS requirements on the AMHS.

In principle, each Flow Type might need to be associated with its own specific values of the three QoS parameters. However, taking into account the large number of possible Flow Types, this would result in a very complex analysis. A suitable approach to reducing this complexity is the introduction of "QoS Flow Type Classes" as follows:

Define a number of "QoS Flow Type Classes" and associate a set of fixed values of the three QoS parameters with each class. Depending on the properties and needs of applications using specific Flow Types, assign these to the QoS Flow Type Classes.

When engineering the network, message traffic volumes of each class need to be taken into account rather than individual Message Flow Types.

Three QoS Flow Type Classes

The approach outlined above is simple and practical provided the number of classes is small. In addition, there is a requirement that the QoS Flow Type Class to which a message belongs, can be coded in some way in the message itself. This requirement comes from the fact that all AMHS components, e.g. MTAs, must be able, at least in principle, to adapt their processing to the QoS Flow Type Class. The means for this coding must come from standard MHS protocol elements, since development specific to AMHS has to be avoided and the possibility of using third-party-service must be kept open. This rules out, for example, the representation of QoS Flow Type Classes by specific User Parts.

The use of the MHS message priority parameter with three values, "urgent", "normal" and "non urgent", belonging to the P1 protocol handled by MTAs, is currently also not suitable for this purpose. The association of values to messages originating from and destined for the AFTN is fixed by SARPs, since such messages traverse an AFTN/AMHS Gateway. This means that values of the MHS priority parameter cannot be freely assigned to message types which are currently handled by the AFTN.

There is no short-term solution to this problem. However, in the long-term, when the majority of messages handled by the AMHS are originated by and destined for native users, the priority parameter may become available for this purpose, keeping in mind, nevertheless, that various practical issues may need to be resolved. In keeping with the three possible values of the MHS message priority parameter, three corresponding QoS Flow Type Classes are defined:

(a) The "High QoS" Flow Type Class

Properties of this QoS Flow Type Class are:

- message transmissions are part of procedures, i.e. the sending and receipt of messages necessarily lead to actions or processing. Without receipt of the message, these actions or processing would not take place, or
- any corrupt information in messages could have serious consequences. This possibility has to be negligible.

(b) The "Medium QoS" Flow Type Class

This class has similar properties to the High QoS Flow Type Class, however the maximum Transit Time requirement can be somewhat less stringent. This distinction is important, because it can be expected that the Maximum Transit Time requirement will have a sensitive effect on network dimensioning.

Properties of this QoS Flow Type Class are:

- message transmissions tend to be of the nature of "information distribution" or "broadcast", possibly based on distribution lists rather than being parts of operational procedures. They are normally not acknowledged. Transit time and reachability constraints are not critical. In the case of non-delivery of messages, this may be noticed by users, in which case backup activities could be initiated; or

- message corruption could have serious consequences and needs to be as low as for the previous class.

(c) The "Low QoS" Flow Type Class

This class has similar properties to the Medium QoS Flow Type Class, however the Destination Non-Reachability and Message Corruption requirements can be somewhat less stringent. This is due to a certain amount of redundancy in the message contents and/or the regular updating and transmission of messages with similar content.

3 Numerical requirements

Guidelines for system requirements.

	High QoS Flow Type Class	Medium QoS Flow Type Class	Low QoS Flow Type Class
Destination Non-Reachability (probability)	< 10 ⁻⁴	< 10 ⁻⁴	< 10 ⁻³
Maximum Transit Delay	< 10 seconds	< 5 minutes	< 5 minutes
Message Corruption (probability)	< 10 ⁻⁶	< 10 ⁻⁶	< 10 ⁻⁵

Table 1: Numerical values of SPACE QoS performance requirements

It must be noted that the above numerical values:

- could be adopted as possible quantitative and qualitative characteristics for setting up the ASIAPAC AMHS network;
- will be reviewed on the basis of compiled AMHS operational experience.

4 Application of performance requirements

The QoS parameters are obviously of importance to the network operators, users and application designers.

The QoS requirements along with the volume requirements for each of the Flow Type Classes at the boundary of the network (servers and gateways) are used, in conjunction with a set of well defined design principles (see 3.3 AMHS topology), in order to:

- determine the local performance of servers and gateways, thus dimensioning their configuration,
- determine the throughput of MTAs and capacity of links,
- draft possible network configurations and select the “optimum” network design, and measure actual network performance.

5 Measurement

The specification of numerical values for Performance Requirements is meaningless unless provision is foreseen for measurement of network performance. Such measurement is needed:

- when implementing and enforcing Service Level Agreements between AMHS service providers and users;
- for acceptance testing of network components;
- to determine network capacity;
- to gain experience in network operation (e.g. testing of various routing strategies, etc.).
- to manage the network efficiently.

Technically, network performance measurement involves, among other things:

- generation of large message/data volumes;
- automation of measurement;
- time-stamping of messages;
- use of statistical analysis.

-End-{ TC "AnnexB" \f C \l "1" }

ANNEX B

AMHS Conformance and Compatibility Test

ANNEX B

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates and inclusion of new sections	all 1.2, 1.3, 3.1, 4.4 – CT422, CT424 3.2, 4.6, 4.7

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1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional tests for an AMHS Conformance Test, which allows checking an AMHS implementation against the AMHS SARPs as a first step to ensure the interoperability between compliant systems.

1.2 Document Structure

Chapter 2 presents the test environment used for AMHS conformance testing.

Chapter 3 defines the addressing plan implemented in the test environment.

Chapter 4 contains the test procedures with subsections for each AMHS functional area.

Each test procedure is presented in a structured way consisting of

- defined test criteria
- a (brief) scenario description
- reference to the relevant part of the standard specification (SARPS section),
- reference to test classes (N, E_n)

1.3 Test Identification Scheme

Each test procedure has an identifier in the form

CT x nn

where CT is an acronym for Conformance Test, x is a number identifying the test group² and nn is a consecutive number identifying the individual test procedure.

Test procedures are presented in six groups:

- test of submission operations ($x=1$)
- test of delivery operations ($x=2$)
- test of transfer operations ($x=3$)
- test of gateway operations converting a user message from AMHS to AFTN ($x=4$)
- test of gateway operations converting a user message from AFTN to AMHS ($x=5$)
- tests with special focus on naming and addressing, e.g. address translations between AMHS and AFTN domains ($x=6$)

² Test groups for AMHS conformance tests are identified in Annex D.

2 AMHS Conformance Test Environment

The AMHS Implementation Under Test (IUT) is embedded in a simulated operational environment formed by the AMHS test tool with three MTA instances (representing three adjacent ATS Message Servers or three neighbour PRMDs) and one AFTN/X.25 source/sink (representing an adjacent AFTN/X.25 environment).

The IUT has an AMHS user agent (UA) attached, which is used in submission and delivery tests. Gateway tests involve either the AFTN/X.25 test application or the AFTN user terminal. It is also possible to make use of the IUT's associated Monitor & Control Position – if available - to observe outcomes of the conversion process, especially in error situations.

The AMHS test tool implements three MTA test applications (MTA-1, -2 and -3) to send and receive AMHS messages (IPM, IPN), reports and probes to and from three directions. The test tool generates AMHS data at the X.400/P1 level. It uses the AFTN/X.25 test application or the AFTN user terminal to send and receive AFTN user messages and AFTN service messages.

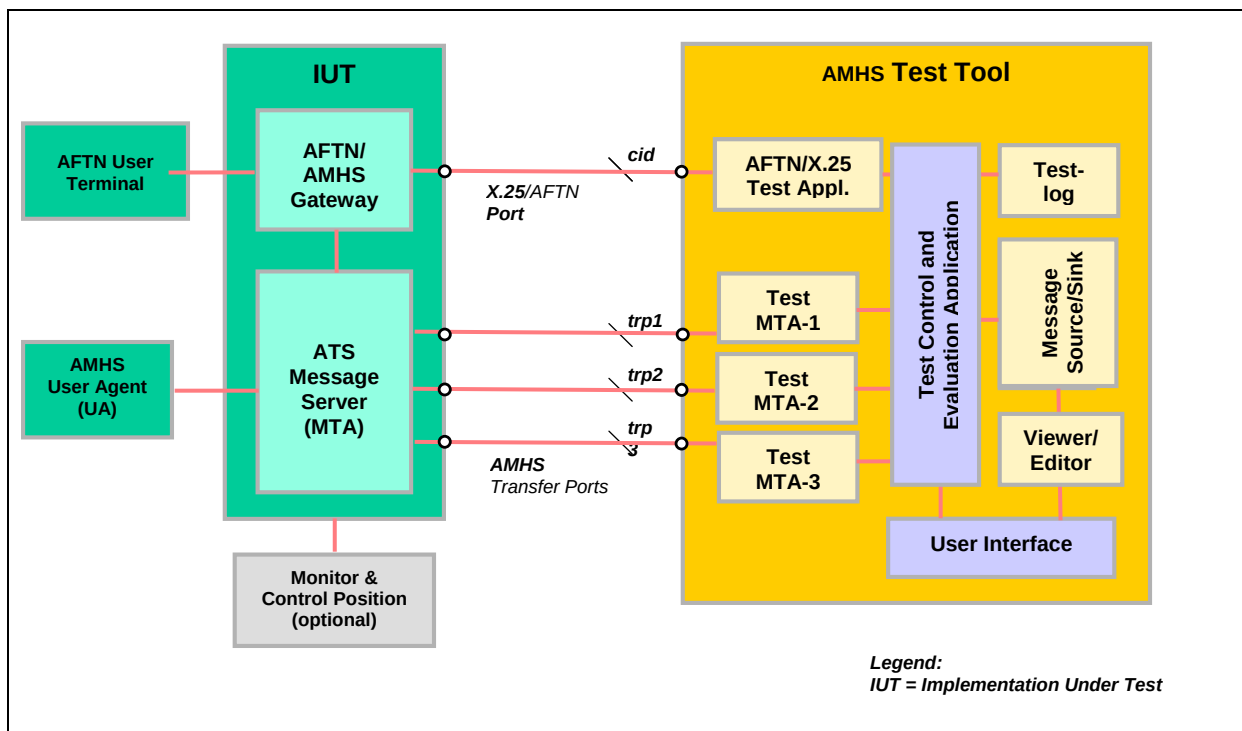


Figure 1: AMHS Conformance Test Environment

Figure 1 shows the test environment used for AMHS conformance tests (setup for the tests CTxxx in Part 3, where xxx refers to the test case number) and the components of the AMHS Test Tool. The AMHS Test Tool will be interconnected with the IUT's (standardized) external interfaces, i.e.

- three AMHS transfer ports (trp1, trp2, trp3) supporting the X.400/P1 protocol over a TCP/IP/LAN³, and
- a AFTN/X.25 port (cid).

³ Optionally, an ATN stack can be supported instead of the TCP/IP interface to support the AMHS X.400/P1 protocol.

All test applications can be controlled independently via user interface through the Test Control and Evaluation Application. The Test Control and Evaluation Application:

- maintains test samples in a repository (message source)
- executes test scripts,
- verifies the received messages (message sink),
- evaluates each performed test step,
- stores every test step result in a test log, and
- keeps record of all sent and received messages during a test run.

Test scenarios involve the test components as depicted in Figure 1 in the following way:

Submission operation tests:

AMHS User Agent	=>	IUT (ATS Message Server)	=>	MTA-1

Transfer operation tests:

MTA-1	=>	IUT (ATS Message Server)	=>	MTA-2 (and for distribution tests also MTA-3)

Delivery operation tests:

MTA-1	=>	IUT (ATS Message Server)	=>	AMHS User Agent

AMHS to AFTN gateway tests:

MTA-1	=>	IUT (ATS Message Server and Gateway)	=>	AFTN/X.25 Test Application or AFTN User Terminal

AFTN to AMHS gateway tests:

AFTN/X.25 Test Application or AFTN User Terminal	=>	IUT (Gateway and ATS Message Server)	=>	MTA-1

3 Addressing Plan for AMHS Conformance Testing

To meet the scope of testing, the test-address space used by AMHS Conformance Testing should include AMHS addresses placed in different AMHS PRMDs (Private Management Domain) and AFTN addresses located in different countries.

As a minimum, there is a need of three generic PRMDs and three generic AFTN countries which may be called: AMHSLAND-1, AMHSLAND-2, AMHSLAND-3, AFTNLAND-1, AFTNLAND-2 and AFTNLAND-3. If required, an extension of the address space should follow the same principles.

This allows covering of all cases of selected addressing schemes, including:

- CAAS (Common AMHS Addressing Scheme) with one single organisation-name value for all location indicators within the PRMD

- CAAS with multiple organisation-name values for different sets of location indicators within the PRMD
- XF (Translated-Form Addressing).

The Nationality Letters AA, AB, AC, BA, BB and BC have been reserved for the purpose of AMHS testing. The PRMD names and addressing schemes used for AMHS Conformance testing are indicated in Table 1:

Nationality Letter	C	ADMD	PRMD	Addressing Scheme
AA	XX	ICAO	AMHSLAND-1	CAAS
AB	XX	ICAO	AMHSLAND-2	CAAS
AC	XX	ICAO	AMHSLAND-3	XF
BA	XX	ICAO	AFTNLAND-1	CAAS
BB	XX	ICAO	AFTNLAND-2	CAAS
BC	XX	ICAO	AFTNLAND-3	XF

Table 1: PRMD names and addressing schemes

The user addresses of AMHSLAND-1 (Addressing scheme: CAAS – single "O" value)

C=XX ADMD=ICAO PRMD=AMHSLAND-1
O=AA-REGION OU1=AAAA → **CN=AAAAMHAA** till **AAAAMHAZ**
 and
CN=AAAAMHBA till **AAAAMHBZ**

The user addresses of AMHSLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=XX ADMD=ICAO PRMD=AMHSLAND-2

O=AB-REGION1	OU1=ABAA	→ CN=ABAAMHAA till ABAAMHAZ
O=AB-REGION1	OU1=ABAB	→ CN=ABABMHAA till ABABMHAZ
O=AB-REGION2	OU1=ABBA	→ CN=ABBAMHAA till ABBAMHAZ
O=AB-REGION2	OU1=ABBB	→ CN=ABBBMHAA till ABBBMHAZ
O=AB-REGION3	OU1=ABCA	→ CN=ABCAMHAA till ABCAMHAZ
O=AB-REGION3	OU1=ABCB	→ CN=ABCBMHAA till ABCBMHAZ

Table 2: AMHSLAND-2

The user addresses of AMHSLAND-3 (Addressing scheme: XF)

C=XX ADMD=ICAO PRMD=AMHSLAND-3
O=AFTN OU1=ACCCMHAA till **ACCCMHAZ** and
OU1=ACCCMHBA till **ACCCMHBZ**

The user addresses of AFTNLAND-1 (Addressing scheme: CAAS – single "O" value)

C=XX ADMD=ICAO PRMD=AFTNLAND-1
O=BA-REGION OU1=BAAA → **CN=BAAAFATA** till **BAAAFATZ**

The user addresses of AFTNLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=XX **ADMD=ICAO** **PRMD=AFTNLAND-2**

O=BB-REGION1	OU1=BBAA	→ CN=BBAAFTAA till BBAAFTAZ
O=BB-REGION1	OU1=BBAB	→ CN=BBABFTAA till BBABFTAZ
O=BB-REGION2	OU1=BBBA	→ CN=BBBAFTAA till BBBAFTAZ
O=BB-REGION2	OU1=BBBB	→ CN=BBBBFTAA till BBBBFTAZ
O=BB-REGION3	OU1=BBCA	→ CN=BBCAFTAA till BBCAFTAZ
O=BB-REGION3	OU1=BBCB	→ CN=BBCBFTAA till BBCBFTAZ

Table 3: AFTNLAND-2

The user addresses of AFTNLAND-3 (Addressing scheme: XF)

C=XX **ADMD=ICAO** **PRMD=AFTNLAND-3**

O=AFTN **OU1=BCAAFTAA** till **BCAAFTAZ** and
OU1=BCAAFTBA till **BCAAFTBZ**

[The portion left empty]

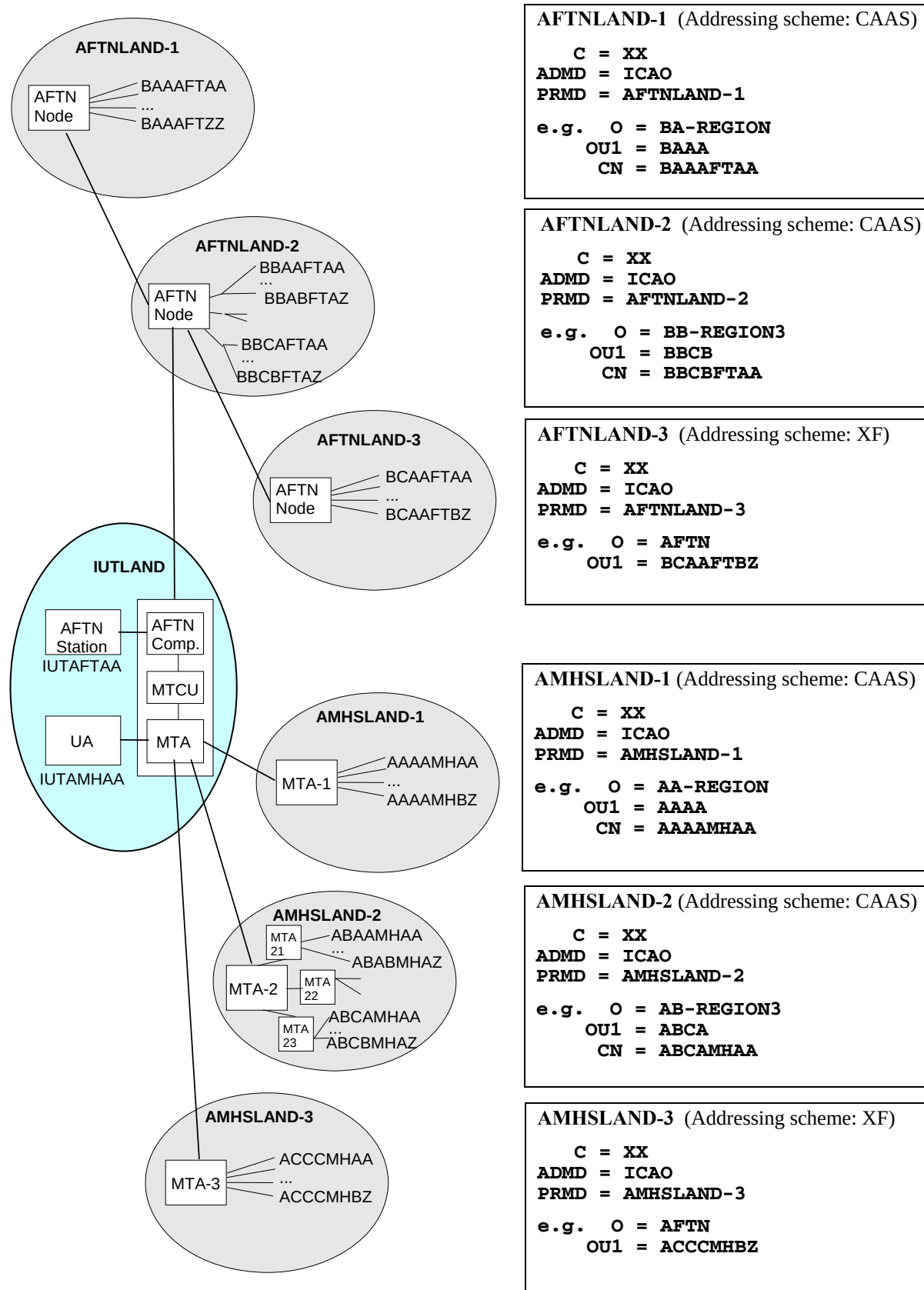


Figure 2: Addressing Plan

For the IUT itself as test addresses could be used alternatively:

The original, operational AMHS and AFTN addresses assigned to the COM Centre or a generic address space taken from the fictitious PRMD/AFTN country IUTLAND including the generic user addresses IUTAFTAA and IUTAMHAA (or a more comprehensive set of addresses in case of CAAS with multiple "O" values) which may be mapped either onto the CAAS (preferred) or XF addressing scheme. The following table shows the generic address space assigned to the IUT.

CAAS (preferred) – single "O"	C= XX ADMD= ICAO PRMD= IUTLAND O= IUT-REGION OU1= IUTA CN= IUTAFTAA C= XX ADMD= ICAO PRMD= IUTLAND O= IUT-REGION OU1= IUTA CN= IUTAMHAA
CAAS (preferred) – multiple "O"	C= XX ADMD= ICAO PRMD= IUTLAND O= IUT-REGION1 OU1= IUTA CN= IUTAFTAA ... C= XX ADMD= ICAO PRMD= IUTLAND O= IUT-REGION1 OU1= IUTA CN= IUTAMHAA C= XX ADMD= ICAO PRMD= IUTLAND O= IUT REGION2 OU1= IUTB CN= IUTBFTAA ... C= XX ADMD= ICAO PRMD= IUTLAND O= IUT REGION2 OU1= IUTB CN= IUTBMHAA C= XX ADMD= ICAO PRMD= IUTLAND O= IUT-REGION3 OU1= IUTC CN= IUTCFTAA ... C= XX ADMD= ICAO PRMD= IUTLAND O= IUT-REGION3 OU1= IUTC CN= IUTCMHAA
XF	C= XX ADMD= ICAO PRMD= IUTLAND O= AFTN OU1= IUTAFTAA C= XX ADMD= ICAO PRMD= IUTLAND O= AFTN OU1= IUTAMHAA

Table 4: Generic address spaces of the IUT

3.1 “Unknown” addresses used for “negative testing”

Some conformance tests use addresses, which are “unknown” for the IUT and provoke specific reaction, e.g. return of a NDR. Several cases must be distinguished:

- The AMHS component (MTA) of the IUT is not able to route the message, neither to an AMHS domain, nor to the AMHS/AFTN gateway (MTCU). For example, this occurs, when the global domain identifier does not match any X.400 routing entry (Table 5).
- The AMHS/AFTN gateway component (MTCU) of the IUT is not able to translate the originator or recipient address from AMHS to AFTN (Table 6).
- The AFTN/AMHS gateway component (MTCU) of the IUT is not able to translate the originator or destination address from AFTN to AMHS (Table 7).
- The AFTN component of the IUT is not able to route an AFTN message.

Note that AFTN routing is not subject of AMHS conformance tests, and therefore no requirement exists for “unknown” AFTN addresses that do not match a routing indicator in the AFTN routing table.

The following “unknown” addresses may be used in the conformance tests:

“Unknown” AMHS addresses used to test MTA routing	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=UNKNOWN</i> <i>O=AA-REGION</i> <i>OU1=AAAA</i> <i>CN=AAAAMHAA</i> ... <i>CN=AAAAMHBZ</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=UNKNOWN</i> <i>O=AB-REGION1</i> <i>OU1=ABAA</i> <i>CN=ABAAMHAA</i> ... <i>CN=ABAAMHBZ</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=UNKNOWN</i> <i>O=AFTN</i> <i>OU1=ACCCMHAA</i> ... <i>OU1=ACCCMHBZ</i>	

Table 5: “Unknown” address space for MTA routing tests

“Unknown” AMHS addresses used to test MTCU mappings from AMHS to AFTN	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AFTNLAND-1</i> <i>O=BA-REGION</i> <i>OU1=BAAA</i> <i>CN=BAAAFABC</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AFTNLAND-1</i> <i>O=BA-REGION</i> <i>OU1=BAAA</i> <i>CN=BAAAF</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AFTNLAND-1</i> <i>O=BA-REGION</i> <i>OU1=BAAA</i> <i>CN=</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AFTNLAND-1</i> <i>O=BA-REGION</i> <i>OU1=</i> <i>CN=BAAAF</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AFTNLAND-1</i> <i>O=BA-REGION</i> <i>OU1=BAAX</i> <i>CN=BAAAF</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AFTNLAND-1</i> <i>O=</i> <i>OU1=BAAA</i> <i>CN=BAAAF</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AMHSLAND-1</i> <i>O=AA-REGION</i> <i>OU1=AAAA</i> <i>CN=AAAAMHABC</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AMHSLAND-1</i> <i>O=AA-REGION</i> <i>OU1=AAAA</i> <i>CN=AAAAMH</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AMHSLAND-1</i> <i>O=AA-REGION</i> <i>OU1=AAAA</i> <i>CN=</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AMHSLAND-1</i> <i>O=AA-REGION</i> <i>OU1=</i> <i>CN=AAAAMHAA</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AMHSLAND-1</i> <i>O=AA-REGION</i> <i>OU1=AAAX</i> <i>CN=AAAAMHAA</i>	
<i>C=XX</i> <i>ADMD=ICAO</i> <i>PRMD=AMHSLAND-1</i> <i>O=</i> <i>OU1=AAAA</i> <i>CN=AAAAMHAA</i>	

“Unknown” AMHS addresses used to test MTCU mappings from AMHS to AFTN				
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAAFATA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=AFTN	OU1=BCAAFTABC
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=AFTN	OU1=BCAAFT
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=AFTN	OU1=
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=	OU1=BCAAFTAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=ATFM	OU1=BCAAFTAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=UNKNOWN	OU1=AAAAMHAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=AFTN	OU1=ACCCMHABC
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=AFTN	OU1=ACCCMH
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=AFTN	OU1=
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=	OU1=ACCCMHAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=UNKNOWN	OU1=ACCCMHAA

Remark: This table contains example of “unknown” O/R addresses which cannot be converted into AF-addresses.

Table 6: “Unknown” AMHS addresses for MTCU mapping tests

“Unknown” AFTN addresses used to test MTCU mappings from AFTN to AMHS	
AAXXXXXX, AAAXXXXX, AAABXXXX, ABXXXXXX, ABAXXXXX, ABBXXXXX, ABCXXXXX, ABACXXXX, ABABXXXX ACXXXXXX, ACCXXXXX, ACAAXXXX, ACBAXXXX BAXXXXXX, BBXXXXXX, BCXXXXXX	

Remark: These addresses match a routing indicator in the AFTN routing table, but not any entry of the MD Look-up Table (Table 8).

Table 7: “Unknown” AFTN addresses for MTCU mapping tests

AFTN/AMHS gateway settings

To fulfil the requirements of the “unknown” addresses following setting of the MD Lookup/CAAS Tables of the AFTN/AMHS gateway (IUT) is requested:

Nationality Letter, Location Indicator	Mapped to	Used addressing scheme
AAAA	C=XX ADMD=ICAO PRMD=AMHSLAND-1	CAAS
ABAA	C=XX ADMD=ICAO PRMD=AMHSLAND-2	CAAS
ABBA	C=XX ADMD=ICAO PRMD=AMHSLAND-2	CAAS
ABCA	C=XX ADMD=ICAO PRMD=AMHSLAND-2	CAAS
ACCC	C=XX ADMD=ICAO PRMD=AMHSLAND-3	XF
BAAA	C=XX ADMD=ICAO PRMD=AFTNLAND-1	CAAS
BBAA	C=XX ADMD=ICAO PRMD=AFTNLAND-2	CAAS
BBBA	C=XX ADMD=ICAO PRMD=AFTNLAND-2	CAAS
BBCA	C=XX ADMD=ICAO PRMD=AFTNLAND-2	CAAS
BCAA	C=XX ADMD=ICAO PRMD=AFTNLAND-3	XF
IUTA	C=XX ADMD=ICAO PRMD=IUTLAND	CAAS

Table 8: MD Lookup Table of the AFTN/AMHS gateway

country-name	ADMD-name	PRMD-name	organization-name	organizational-unit-name
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=AAAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-2	O=AB-REGION1	OU1=ABAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-2	O=AB-REGION2	OU1=ABBA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-2	O=AB-REGION3	OU1=ABCA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION1	OU1=BBAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION2	OU1=BBBA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION3	OU1=BBCA
C=XX	ADMD=ICAO	PRMD=IUTLAND	O=IUT-REGION	OU1=IUTA

Table 9: CAAS Table settings of the AFTN/AMHS gateway

3.2 AMHS O/R address used for asymmetric re-conversion tests

Within the AMHS/AFTN address conversion tests for the following AMHS addresses are used to demonstrate the robustness of the address conversion of the IUT introduced by the PDR M7100001⁴. The AFTN addresses will be extracted from the original O/R (Originator/Recipient) address, but the re-conversions do not result in the same AMHS addresses. These AMHS addresses, the AFTN addresses resulting from conversion and the re-converted AMHS addresses are listed in the following table:

Used AMHS Address	Converted AFTN Address	Re-converted AMHS Address
(1) C=XX ADMD=ICAO PRMD=AFTNLAND-1 O=BA-REGION OU1=BBAA CN=BBAAFTAA	BBAAFTAA	C=XX ADMD=ICAO PRMD=AFTNLAND-2 O=BB-REGION1 OU1=BBAA CN=BBAAFTAA
(2) C=XX ADMD=ICAO PRMD=AFTNLAND-2 O=AFTN OU1=BCAAFTAA	BBAAFTAA	C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=AFTN OU1=BCAAFTAA
(3) C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=AFTN OU1=BCAA CN=BCAAFTAA	BCAAFTAA	C=XX ADMD=ICAO PRMD=AFTNLAND-3 O=AFTN OU1=BCAAFTAA
(4) C=XX ADMD=ICAO PRMD=AFTNLAND-1 O=AFTN OU1=BAAFTAA	BAAFTAA	C=XX ADMD=ICAO PRMD=AFTNLAND-1 O=BA-REGION OU1=BAAA CN=BAAFTAA
(5) C=XX ADMD=ICAO PRMD=AMHSLAND-1 O=AA-REGION OU1=ABAA CN=ABAAMHAA	ABAAMHAA	C=XX ADMD=ICAO PRMD=AMHSLAND-2 O=AB-REGION1 OU1=ABAA CN=ABAAMHAA
(6) C=XX ADMD=ICAO PRMD=AMHSLAND-1 O=AFTN OU1=ACCCMHAA	ACCCMHAA	C=XX ADMD=ICAO PRMD=AMHSLAND-3 O=AFTN OU1=ACCCMHAA
(7) C=XX ADMD=ICAO PRMD=AMHSLAND-3 O=AFTN OU1=ACCC CN=ACCCMHAA	ACCCMHAA	C=XX ADMD=ICAO PRMD=AMHSLAND-3 O=AFTN OU1=ACCCMHAA
(8) C=XX ADMD=ICAO PRMD=AMHSLAND-1 O=AFTN OU1=AAAAMHAA	AAAAMHAA	C=XX ADMD=ICAO PRMD=AMHSLAND-1 O=AA-REGION OU1=AAAA CN=AAAAMHAA

Table 10: AMHS addresses used for asymmetric re-conversion tests

⁴ To reduce message rejections due to non-symmetrical address conversion, it is necessary to:

- detect such situations by checking the result of backward conversion of the address and report the error situations,
- convert the message to AFTN and transfer it, despite the detected non-symmetry.

4 Test Procedures

4.1 Submission Operations

CT101 - Forward a submitted IPM

CT101	Forward a submitted IPM
Test criteria	This test is successful, if the IUT forwards a submitted ATS message (IPM) to a peer MTA correctly.
Scenario description	From the UA send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user reachable via AMHS transfer port <i>trp1</i>. • Message 1 (CT101M01) shall have ATS-message-priority KK. • Message 2 (CT101M02) shall have ATS-message-priority GG. • Message 3 (CT101M03) shall have ATS-message-priority FF. • Message 4 (CT101M04) shall have ATS-message-priority DD. • Message 5 (CT101M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. Verify the messages received by the test tool at the AMHS interface. Check the format and contents of MTE, IPM heading and body. In particular, verify the priority value contained in the MTE and the following elements contained in the IPM body: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.2.3.2.3.1 (ATS-Message-Header)
Test class	Normal AMHS communications

4.2 Delivery Operations

CT201 – Deliver an IPM to a local AMHS user

CT201	Deliver an IPM to a local AMHS user
Test criteria	This test is successful, if the IUT correctly delivers an ATS message (IPM) received from a peer MTA to its local AMHS user.
Scenario description	From the AMHS Test Tool send a sequence of five ATS messages (IPMs) to the IUT addressing a local UA. • The first ATS message shall have ATS-message-priority KK. • The second ATS message shall have ATS-message-priority GG. • The third ATS message shall have ATS-message-priority FF. • The fourth ATS message shall have ATS-message-priority DD. • The fifth ATS message shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Verify the messages received at the AMHS user agent. In particular, verify the following elements displayed at the AMHS user agent: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.1.6 (AMHS routing)
Test class	Normal AMHS communications

CT202 – Deliver an IPM containing erroneous ATS-message-header or ATS-message text format

CT202	Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format
Test criteria	This test is successful, if the IUT, when receiving an IPM containing erroneous ATS-message-header or ATS-message-text from a peer MTA: • delivers this message to its local AMHS user regardless of the contained error, or • indicates the error situation, or • returns a non-receipt notification or NDR.
Scenario description	From the AMHS Test Tool send a sequence of six messages (IPMs) to the IUT addressed to a local UA. • The first message (IPM) shall contain an empty ATS-message-priority. • The second message (IPM) shall contain an invalid ATS-message-priority • The third message (IPM) shall contain an empty ATS-message-filing-time. • The fourth message (IPM) shall contain an invalid ATS-message-filing-time. • The fifth message (IPM) shall contain an OHI text longer than 53 characters. • The sixth message (IPM) shall contain an empty ATS-message-header. • The seventh message (IPM) shall contain an empty ATS-message-text. Verify that the messages are delivered to the UA. Analyse the IUT's log files with respect to delivered messages and reported errors, if any. Check the contents of the received ATS message and verify the ATS-message-priority, ATS-message-filing-time and ATS-message-text displayed at the UA⁵.
AMHS SARPs reference	3.1.2.2.3.2 (IPM text)
Test class	Erroneous AMHS parameters

⁵ The displayed message depends on the UA capabilities

CT203 – Deliver an IPM containing empty or invalid IPM heading fields

CT203	Deliver an IPM containing empty or invalid IPM heading fields
Test criteria	This test is successful, if the IUT when receiving an ATS message (IPM) from a peer MTA containing empty or invalid IPM heading fields: • delivers this message to its local AMHS user regardless of the empty or invalid IPM heading fields, or • indicates the error situation, or • returns a non-receipt notification or NDR.
Scenario description	From the AMHS Test Tool send a sequence of messages (IPMs) to the IUT addressing a local UA. The Message Transfer Envelope (MTE) shall be correctly formatted while the IPM heading contains empty or invalid values. • The first message shall contain an empty originator field in the IPM heading. • The second message shall contain neither primary nor copy nor blind copy recipient addresses in the IPM heading. • The third message shall contain a primary recipient with an invalid combination of the notification-request flag (rn bit = true and nrn bit = false). Check the IUT's log files with respect to delivered messages and reported errors, if any. Check any messages received and displayed at the UA⁶.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent – AMH21)
Test class	Erroneous IPMS information objects

⁶ The displayed message depends on the UA capabilities.

4.3 Transfer Operations

CT301 – Transfer messages (IPMs and IPNs)

CT301	Transfer messages (IPMs and IPNs)
Test criteria	This test is successful, if the IUT transfers (forwards) messages (IPMs, IPNs) correctly.
Scenario description	From the AMHS Test Tool send a sequence of messages to the IUT's transfer port <i>trp1</i>. All envelopes shall contain a remote recipient address reachable via transfer port <i>trp2</i>. All messages shall have the <i>originator-report-request</i> flag and the <i>originating-MTA-report-request</i> flag set to "non-delivery-report". The sequence of messages shall consist of: • an IPM with ia-5-text body part, • an IPM with general-text body part, • an IPN containing a RN, • an IPN containing a NRN. Monitor the outcome of IUT transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that: • all messages are routed correctly via transfer port <i>trp2</i>, and there is no message misrouted, i.e. no output from the IUT at transfer port <i>trp1</i> or <i>trp3</i>, • there is no NDR returned via <i>trp1</i>, • the content of the forwarded message has not changed, but is identical to the original content, • trace information is added in the message transfer envelope (MTE).
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT302 – Transfer a report

CT302	Transfer a report
Test criteria	This test is successful, if the IUT transfers (forwards) reports correctly.
Scenario description	From the AMHS Test Tool send two manually prepared reports (a DR and a NDR) to the IUT's transfer port <i>trp1</i>. The report transfer envelope shall contain a remote recipient address reachable via transfer port <i>trp2</i>. The reports shall contain fictitious values for those fields, which are normally automatically generated from the related subject message, for example, the subject-MTS-identifier and originally intended recipients. Monitor the outcome of IUT transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that: • all reports are routed correctly via transfer port <i>trp2</i>, and there is no report misrouted, i.e. no output from the IUT at transfer port <i>trp1</i> or <i>trp3</i>, • the content of the forwarded report has not changed, but is identical to the original report content, • trace information is added in the report transfer envelope (RTE).
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT303 – Transfer a probe

CT303	Transfer a probe
Test criteria	This test is successful, if the IUT transfers (forwards) a probe testing the reachability of a remote AMHS user correctly and returns a NDR, if the probe contains a content-length value which exceeds the length supported by the IUT's MTA component.
Scenario description	From the AMHS Test Tool send two probes to the IUT's transfer port <i>trp1</i>. The probe (envelope) shall contain an intended recipient address reachable via transfer port <i>trp2</i>. • The first probe shall contain a content length value of 1.048.576 (octets), which is a length, which must be supported by the IUT's MTA component. • The second probe shall contain a content length value of 2.147.483.647 (octets), which is the maximum length in octets specified in X.411:06/1999. It equals the largest integer in 32 bits. Monitor the outcome of IUT transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that: • the first probe is routed correctly via transfer port <i>trp2</i>, and there is not any NDR returned from the IUT, • the second probe is either routed correctly via transfer port <i>trp2</i> or rejected, if such a length is not supported by the IUT's transfer capabilities. Check, if either a forwarded probe or a NDR is received from the IUT. <i>Note. – The AMHS Test Tool shall respond with a DR, if it receives a valid probe for a user residing in the test tool's domain.</i>
AMHS SARPs reference	3.1.2.2.2 (ATS message server), 3.1.2.1.2.2 (AMHS information model)
Test class	Normal AMHS communications

CT304– Reject a message, if DL expansion is prohibited

CT304	Reject a message, if DL expansion is prohibited
Test criteria	This test is successful, if the IUT distributes a received IPM addressing a distribution list (DL) only, if the <i>dl-expansion-prohibited</i> flag is set to “false” and rejects the message, if the <i>dl-expansion-prohibited</i> flag is set to “true”. In the latter case, the IUT shall return a NDR.
Scenario description	From the AMHS Test Tool send two IPMs to the IUT’s transfer port <i>trp1</i>. The recipient in the message transfer envelope (MTE) shall address a distribution list. The distribution list, in turn, shall address three remote AMHS users, one reachable via transfer port <i>trp1</i>, one reachable via <i>trp2</i> and one via <i>trp3</i>. The first message shall have the <i>dl-expansion-prohibited</i> flag set to “false” and the second to “true”. Monitor the outcome of transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that: • only the first message is distributed by the IUT and three messages are received at the AMHS Test Tool, • a NDR is returned to <i>trp1</i> for the second message.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group)
Test class	Normal AMHS communications

CT305– Loop detection

CT305	Loop detection
Test criteria	This test is successful, if the IUT detects that the received message, IPN, report and probe have traversed a loop.
Scenario description	Create a temporary routing loop, i.e. modify the routing table in MTA-2 to forward all messages addressed to AMHSLAND-2 to MTA-1, which in turn forwards those messages to the IUT. Configure the loop detection mechanism in the AMHS Test Tool (MTA-1 and MTA-2) to allow a message to run through the loop 32 times. From the AMHS Test Tool send an AMHS message (IPM) to the IUT addressing an AMHS user in AMHSLAND-2. Verify that: • the IUT detects the loop, • discards the message and • sends a NDR (before the test tool detects that the message has traversed the loop 32 times). Repeat the test for an IPN, a report and a probe. The IUT shall detect the loop in all cases and return a NDR for the IPN and the probe (but not for the report).
AMHS SARPs reference	3.1.1, Note 2a (ISO/IEC 10021), <i>See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1.</i>
Test class	MHS procedural errors

CT306– Generate a NDR, if transfer fails

CT306	Generate a NDR, if transfer fails
Test criteria	This test is successful, if the IUT correctly generates a NDR, if it can not transfer the received IPM towards the specified recipient.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT's transfer port <i>trp1</i>. All messages shall contain an unknown primary recipient address and have different combinations of settings for the <i>originator-report-request</i> flag and the <i>originating-mta-report-request</i> flag according to Table 11. Verify that in all cases the IUT returns a NDR. Verify that the report is always addressed to the originator of the message. Verify that the <i>originator-report-request</i> flag setting in the per-recipient-fields of the generated NDR is equal to the setting in the subject message.
AMHS SARPs reference	3.1.2.2.2.1.1 (AMH22/AMH11)
Test class	Normal AMHS communications

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result
1	no-report(0)	report(2)	IUT returns a NDR with the <i>originator-report-request</i> flag set to no-report(0).
2	non-delivery-report(1)	report(2)	IUT returns a NDR with the <i>originator-report-request</i> flag set to non-delivery-report(1).
3	report(2)	report(2)	IUT returns a NDR with the <i>originator-report-request</i> flag set to report(2).

Table 11: CT306 report request settings⁷

⁷ Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report=request (see ITU-T recommendation X.411, clause 1.2.2.1.1.1.8)

4.4 Gateway Operations (AMHS to AFTN)

CT401 – Convert an incoming IPM to AFTN format

CT401	Convert an incoming IPM to AFTN format
Test criteria	This test is successful, if the IUT converts an IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user. • The first ATS message shall have ATS-message-priority KK. • The second ATS message shall have ATS-message-priority GG. • The third ATS message shall have ATS-message-priority FF. • The fourth ATS message shall have ATS-message-priority DD. • The fifth ATS message shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text and address an AFTN user reachable via the AFTN/X.25 port <i>cid1</i>. The optional-heading-information element shall be empty⁸. The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”. Verify the messages received at the AFTN/X.25 interface of the AMHS Test Tool. Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.
AMHS SARPs reference	3.1.2.3.5.2 (AMHS IPM conversion)
Test class	Normal AMHS communications

⁸ There is a separate test case specified, that will test the conversion of the optional-heading-information element.

CT402 – Convert an IPM containing optional-heading-information in the ATS-message-header

CT402	Convert an IPM containing optional-heading-information in the ATS-message-header
Test criteria	This test is successful, if the IUT converts an IPM containing optional-heading-information (OHI) in the ATS-message-header correctly into AFTN format and returns a non-delivery report, if it cannot convert the message, because the OHI text is too long.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over the AMHS transfer port to the IUT. The sequence of IPMs shall address a remote AFTN user. • The first ATS message shall have FF priority and contain OHI text of less than 53 characters⁹. • The second ATS message shall have FF priority and contain OHI text of exactly 53 characters. • The third ATS message shall have FF priority and contain OHI text of more than 53 characters. • The fourth ATS message shall have SS priority and contain OHI text of less than 48 characters¹⁰. • The fifth ATS message shall have SS priority and contain OHI text of exactly 48 characters. • The sixth ATS message shall have SS priority and contain OHI text of more than 48 characters. Check the AFTN messages received at the X.25/AFTN port and verify the AFTN format. In particular, check the format and contents of the OHI. Verify that the IUT returns a NDR for the third and sixth ATS message containing the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.1.5-b): • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, • “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and • “unable to convert to AFTN due to ATS-Message-Header or Heading Fields syntax error” for the supplementary-information.

⁹ OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator.)

¹⁰ OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 character priority alarm.)

AMHS SARPs reference	3.1.2.3.5.2.2.8 (OHI) 3.1.2.2.3.2.3.4 (ATS Message Optional Heading Info) PDR M4100001
Test class	Normal AMHS communications

CT403 – Generate a DR for a successfully translated IPM

CT403	Generate a DR for a successfully translated IPM
Test criteria	This test is successful, if the IUT returns a DR for a successfully translated ATS message (IPM), if a report was requested by the originator or the originating MTA.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT addressing an AFTN user. The IPMs shall have ATS-Message-Priority “FF” and different combinations of settings for the <i>originator-report-request</i> flag and the <i>originating-mta-report-request</i> flag according to Table 12. The IUT shall convert all ATS messages into AFTN format and forward them via the AFTN/X.25 port <i>cid1</i> to the AMHS Test Tool. Check the messages received at the AMHS interface and verify that the IUT sends a DR for every ATS message, if: a) the <i>originator-report-request</i> element is set to “report”, or b) the <i>originating-mta-report-request</i> element is set to “report” or “audited-report”. (see Table 12).
AMHS SARPs reference	3.1.2.3.5.6.1.3 (generation of AMHS reports)
Test class	Normal AMHS communications

ATS Message	Value of the <i>originator-report-request</i> element	Value of the <i>originating-MTA-report-request</i> element	Expected result for conformance test CT403
1	no-report(0)	non-delivery-report(1)	IUT does not return a report
2	no-report(0)	report(2)	IUT returns a DR
3	no-report(0)	audited-report(3)	IUT returns a DR
4	non-delivery-report(1)	non-delivery-report(1)	IUT does not return a report
5	non-delivery-report(1)	report(2)	IUT returns a DR
6	non-delivery-report(1)	audited-report(3)	IUT returns a DR
7	report(2)	report(2)	IUT returns a DR
8	report(2)	audited-report(3)	IUT returns a DR

Table 12: CT403 report request settings¹¹

¹¹ Note that the *originating-MTA-report-request* argument shall specify at least the level specified in the *originator-report-request* (see ITU-T recommendation X.411, clause 12.2.1.1.1.8)

CT404 – Generate a NDR, if implicit conversion is prohibited

CT404	Generate a NDR, if implicit conversion is prohibited
Test criteria	This test is successful, if the IUT rejects a received IPM addressed to an AFTN user, if the <i>implicit-conversion-prohibited</i> attribute is set to “true” and generates a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The IPMs shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port <i>cid1</i>. The first message shall have the argument <i>implicit-conversion-prohibited</i> set to “false” and the second message set to “true”. Verify that only the first message is transferred over the AFTN/X.25 test interface to the AMHS Test Tool, and a NDR is generated for the second message and received by the AMHS Test Tool via the transfer port <i>trp1</i>. Verify that this NDR contains the following elements (as specified in the AMHS SARPs 3.1.2.3.5.2.1.2): • “conversion-not-performed” for the <i>non-delivery-reason-code</i>, • “implicit-conversion-prohibited” for the <i>non-delivery-diagnostic-code</i>, and • “unable to convert to AFTN” for the <i>supplementary-information</i>.
AMHS SARPs reference	3.1.2.3.5.2.1.2
Test class	Normal AMHS communications

CT405 – Generate a NDR, if the ATS-message-header has a syntax error

CT405	Generate a NDR, if the ATS-message-header has a syntax error
Test criteria	This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing erroneous ATS-message-header or ATS-message-text.
Scenario description	From the AMHS Test Tool send a sequence of seven messages (IPMs) to the IUT addressed to an AFTN user reachable via the IUT's gateway. • The first message (IPM) shall contain an empty ATS-message-priority. • The second message (IPM) shall contain an invalid ATS-message-priority • The third message (IPM) shall contain an empty ATS-message-filing-time. • The fourth message (IPM) shall contain an invalid ATS-message-filing-time. • The fifth message (IPM) shall contain OHI text longer than 53 characters. • The sixth message (IPM) shall contain an empty ATS-message-header. • The seventh message (IPM) shall contain an empty ATS-message-text. Check the messages received at the AMHS- and X.25/AFTN-interfaces of the AMHS Test Tool. Verify that the IUT - except for the seventh message¹² - does not convert the received AMHS messages into AFTN, but returns a NDR for each message via its transfer port <i>trp1</i>. Verify that all NDRs contains the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.1.5-b): • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, • “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and • “unable to convert to AFTN due to ATS-Message-Header or Heading Fields syntax error” for the supplementary-information.
AMHS SARPs reference	3.1.2.3.5.2.1.5-b), 3.1.2.2.3.2.3 (ATS Message Header)
Test class	Erroneous AMHS parameters

¹² The AMHS SARPS (3.1.2.2.3.2.4) do not exclude an IPM containing empty ATS-message-text.

CT406 – Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters

CT406	Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters
Test criteria	This test is successful, if the IUT, when it receives an ATS message with long ATS-message-text of more than 1800 characters, a) rejects the message and returns a NDR, or b) splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Attm. B (changed from D to B with Amendment 78) <i>Note:– The AMHS SARPS (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b).</i>
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT containing ATS-message-text of 4500 characters to an AFTN user recipient. <i>If case a) is implemented:</i> Verify that the IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the TSMS-AMHS interface. Verify that the NDR contains the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>; • “content-too-long” for the <i>non-delivery-diagnostic-code</i>; and • “unable to convert to AFTN due to message text length” for the <i>supplementary-information</i>. <i>If case b) is implemented:</i> Verify that (at least) three AFTN messages are received at the AFTN/X.25 test interface. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM.
AMHS SARPs reference	3.1.2.3.5.2.1.7
Test class	Normal AMHS communications

CT407 – Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters

CT407	Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters
Test criteria	This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with lines of more than 69 characters, if <i>conversion-with-loss-prohibited</i> is set to “false”. Otherwise the IUT shall reject the message and generate a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port <i>cid1</i>. The IPM body shall contain ATS-message-text with lines exceeding 69 characters. In the first message the argument <i>conversion-with-loss-prohibited</i> shall be set to “false” and in the second message to the value “true”. Verify that only messages are received at the AFTN/X.25 test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> was set to “false”. Check the correct format of the AFTN message. Verify that an additional line feed has been inserted for every text line exceeding 69 characters. In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port <i>trp1</i> with the following values: • “conversion-not-performed” for the <i>non-delivery-reason-code</i>, - and • “line-too-long” for the diagnostic code.
AMHS SARPs reference	3.1.2.3.5.2.1.6 a)
Test class	Normal AMHS communications

CT408 – Convert or reject an IPM, if the ATS-message-text contains characters not allowed by ICAO Annex 10

CT408	Convert or reject an IPM, if the ATS-message-text contains characters not allowed by ICAO Annex 10
Test criteria	This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with characters not allowed by ICAO Annex 10, if <i>conversion-with-loss-prohibited</i> is set to “false”. Otherwise the IUT shall reject the message and generate a NDR.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/X.25 port <i>cid1</i>. • In the first message the ATS-Message-Text shall contain one or more IA-5 characters that are not allowed by ICAO Annex 10, e.g. the punctuation symbol “;” and have the <i>conversion-with-loss-prohibited</i> argument set to “false”, • The second message shall contain equal ATS-Message-Text, but have the <i>conversion-with-loss-prohibited</i> argument set to “true”, Verify that only messages are received at the AFTN/X.25 test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> was set to “false”. In such a case, check the converted AFTN message format. In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port <i>trp1</i> with the following values: • “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and • “punctuation-symbol-loss” for the diagnostic code.
AMHS SARPs reference	3.1.2.3.5.2.1.6 c), d) and e)
Test class	Normal AMHS communications

CT409 – Reject an IPM with multiple body part

CT409	Reject an IPM with multiple body part
Test criteria	This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing multiple body parts.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT transfer port <i>trp1</i>. The message shall contain two (or more) IA5-text body parts. Verify that a NDR is generated and received by AMHS Test Tool via the transfer port <i>trp1</i> with the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, • “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and • “unable to convert to AFTN due to multiple body parts” for the <i>supplementary-information</i>.
AMHS SARPs reference	3.1.2.3.5.2.1.3
Test class	Erroneous AMHS parameters

CT410 – Distribute an IPM to AMHS and AFTN users

CT410	Distribute an IPM to AMHS and AFTN users
Test criteria	This test is successful, if the IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
Scenario description	From the AMHS Test Tool send two ATS messages (IPMs) addressing both AMHS and AFTN users to the IUT via transfer port <i>trp1</i>. • The IPM Heading of the first message shall contain two primary recipients, which are one AMHS and one AFTN user and two copy recipients, which are also one AMHS and one AFTN user. • The IPM Heading of the second message shall contain two primary recipients, which are one AMHS and one AFTN user and two blind copy recipients, which are also one AMHS and one AFTN user. The message shall have the <i>originator-report-request</i> flag set to “non-delivery-report”. Verify that both messages (IPMs) are: • relayed to AMHS transfer port <i>trp2</i>, and • relayed and converted to AFTN format and transferred via the AFTN/X.25 port <i>cid1</i>. Check the messages received at the AMHS-interface. Verify that: • both messages contain an MTE with all AMHS recipient addresses and an IPM heading with all AMHS <u>and</u> AFTN recipients. Check the messages received at the AFTN/X.25 port. Verify that: • both messages contain the addresses of both AFTN users.
AMHS SARPs reference	3.1.2.2.1 (ATS message user agent), 3.1.2.2.2 (ATS message server), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications

CT411 – Expand a DL addressing both AMHS and AFTN users

CT411	Expand a DL addressing both AMHS and AFTN users
Test criteria	This test is successful, if the IUT distributes an IPM addressing AMHS and AFTN users in a distribution list correctly.
Scenario description	From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port <i>trp1</i>. The recipient contained in the MTE, shall address a distribution list, for which the IUT is responsible. The distribution list shall address one AMHS user and two AFTN users. The AMHS user is reachable via the AMHS transfer port <i>trp2</i> and the AFTN users are reachable via the X.25/AFTN port <i>cid1</i>. The first message shall have the <i>dl-expansion-prohibited</i> flag set to “false” and the second to “true”. Check the messages received at the AMHS and X.25/AFTN interfaces of the AMHS Test Tool. Verify that only the first IPM is: - transferred via AMHS transfer port <i>trp2</i>, and - converted to AFTN format and transferred via the X.25/AFTN port <i>cid1</i>. Verify for the first IPM that: - one message is received at the AMHS-interface <i>trp2</i> containing (only) the AMHS recipient address in the MTE and the DL recipient address in the IPM heading - one AFTN message is received at the X.25/AFTN-interface containing the addresses of both AFTN users Verify for the second message that: - a NDR is returned to <i>trp1</i>.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications

CT412 –Split or reject an incoming IPM addressing more than 21 AFTN users

CT412	Split or reject an incoming IPM addressing more than 21 AFTN users
Test criteria	This test is successful, if the IUT receives an ATS message (IPM) addressing more than 21 AFTN users and a) splits the received IPM into several messages, each addressing 21 or less AFTN users if no more than 512 AFTN users are addressed, or b) rejects the received IPM and returns a NDR if more than 512 AFTN users are addressed. <i>Note: – With the resolution of PDR M4050004 a message with more than 21, but no more than 512 recipient addresses must not be rejected by the gateway.</i>
Scenario description	From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port <i>trp1</i>. The message shall have the <i>originator-report-request</i> flag set to “non-delivery-report”. • Send one IPM with 512 recipients. Verify that this message is split into 25 AFTN messages, each of the first 24 messages containing 21 addresses, the last one containing 8 addresses. • Send one IPM with 513 recipients. Verify that the IUT does <u>not</u> convert the AMHS message into AFTN format, but returns a NDR via its transfer port <i>trp1</i> with the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, • “too-many-recipients” for the <i>non-delivery-diagnostic-code</i>, and • “unable to convert to AFTN due to number of recipients” for the <i>supplementary-information</i>.
AMHS SARPs reference	3.1.2.3.5.2.1.8, PDR M4050004
Test class	Normal AMHS communications

CT413 – Remove an unknown address before conversion into AFTN format

CT413	Remove an unknown address before conversion into AFTN format
Test criteria	This test is successful, if the IUT that receives an ATS message (IPM) addressed to multiple AFTN users removes any unknown address before conversion.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT via AMHS transfer port <i>trp1</i>. The message shall have two (primary) recipients addressing two AFTN users. Only the AMHS address of the first AFTN user can be translated by the MTCU into a valid AFTN addressee indicator, the AMHS address of the second AFTN user is unknown and the MTCU can not find a match in its address look-up table. Check the messages received at the AMHS- and X.25/AFTN-interfaces of the AMHS Test Tool. Verify that the IUT: • converts the received AMHS message into AFTN format, removes the unknown address and sends it via the X.25/AFTN-interfaces <i>cid1</i>, • returns a NDR via transfer port <i>trp1</i> for the unknown recipient. Verify that the NDR contains the following elements (as specified in the AMHS SARPs, section 3.1.2.3.5.2.2.6.2 d): • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and • “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i>
AMHS SARPs reference	3.1.2.3.5.2.2.6.2
Test class	Normal AMHS communications

CT414 – Convert an incoming AFTN acknowledgement

CT414	Convert an incoming AFTN acknowledgement
Test criteria	This test is successful, if the IUT converts an AFTN acknowledgement (SS ACK message) to a receipt notification correctly.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface <i>cid1</i>. The IPM shall have the <i>receipt-notification</i> request flag activated and the <i>ATS-message-priority</i> shall have the value “SS”. The IUT shall convert the AMHS message to an AFTN message with priority indicator “SS” and send it via the AFTN/X.25 test interface <i>cid1</i> to the AMHS Test Tool. Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement to the IUT (via the AFTN/X.25 test interface <i>cid1</i>). The subject message shall refer to the received AFTN user message. The IUT shall convert this AFTN acknowledgement to an AMHS receipt notification and send it via the AMHS test interface <i>trp1</i>. Verify that the AMHS Test Tool receives a receipt notification. In particular, verify that: - the originator indicator contained in the AFTN acknowledgement is translated to the <i>ipn-originator</i> (IPN) and the <i>originator-name</i> (MTE), - the <i>receipt-time</i> of the IPN is generated from the <i>filing time</i> of the AFTN acknowledgement, - the value of the <i>priority</i> element in the MTE is set to “urgent”, - the values of <i>subject-ipm</i> and <i>recipient-name</i> are inserted correctly from log entries.
AMHS SARPs reference	3.1.2.3.4.3 (conversion AFTN ACK)
Test class	Normal AMHS communications

CT415 – Incoming AFTN acknowledgement with unknown AFTN originator

CT415	Incoming AFTN acknowledgement with unknown AFTN originator
Test criteria	This test is successful, if the IUT informs its control position, when the AFTN acknowledgement (SS ACK message) can not be converted because the AFTN originator is unknown.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface <i>cid1</i>. The IPM shall have the <i>receipt-notification</i> request flag activated and the <i>ATS-message-priority</i> shall have the value “SS”. The IUT shall convert the AMHS message to an AFTN message with priority indicator “SS” and send it via the AFTN/X.25 test interface <i>cid1</i> to the AMHS Test Tool. Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement (SS ACK) to the IUT (via the AFTN/X.25 test interface <i>cid1</i>). The subject message shall refer to the received AFTN user message, but the originator of the AFTN acknowledgement (SS ACK) message shall be unknown to the IUT, i.e. not contained in any of the IUT’s conversion or address mapping tables. Check the output of the IUT at the AMHS test interfaces and the control position. Verify that the IUT does not send any IPM nor IPN via the AMHS transfer port, but reports the error situation to the control position.
AMHS SARPs reference	3.1.2.3.4.3.2.3
Test class	Erroneous AMHS parameters

CT416 – Incoming AFTN acknowledgement relating to a subject message without receipt-notification request

CT416	Incoming AFTN acknowledgement relating to a subject message without receipt-notification request
Test criteria	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not have the receipt notification flag set.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface <i>cid1</i>. The message shall have the <i>ATS-message-priority</i> set to “SS”, however, the <i>receipt-notification-request</i> shall be deactivated. The IUT shall convert the AMHS message into an AFTN message with priority indicator “SS” and send it over the AFTN/X.25 test interface <i>cid1</i> to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN SS acknowledgement to the IUT with the subject message relating to the previously received AFTN user message. Since the initial ATS message (IPM) did not have the <i>receipt-notification-request</i> activated, the IUT shall <u>not</u> convert the AFTN acknowledgement into a RN, but encapsulate the AFTN acknowledgement into an IPM, instead. Check the output of the IUT at the AMHS test interface <i>trp1</i> and the control position. Verify that the IUT sends an ATS message (IPM) with the addressed AMHS user as recipient. Verify that the message contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.
AMHS SARPs reference	3.1.2.3.4.3.1.2
Test class	MHS procedural errors, Erroneous IPMS information objects

CT417 – Incoming AFTN acknowledgement without related subject message

CT417	Incoming AFTN acknowledgement without related subject message
Test criteria	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not pass the gateway before.
Scenario description	From the AMHS Test Tool send an AFTN acknowledgement (SS ACK message) via the AFTN/X.25 test interface <i>cid1</i> to the IUT addressing an AMHS user. The AFTN acknowledgement shall have a fictitious origin subject message in the message text. Check the output of the IUT at the AMHS transfer port and the control position. Verify that the IUT sends an IPM with the addressed AMHS user as recipient. Verify that the IPM contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.
AMHS SARPs reference	3.1.2.3.4.3.1.1
Test class	MHS procedural errors , Erroneous IPMS information objects

CT418 – Convert an AFTN SVC “Unknown Addressee Indicator” to a NDR

CT418	Convert an AFTN SVC “Unknown Addressee Indicator” to a NDR
Test criteria	This test is successful, if the IUT converts a received AFTN service message (SVC) of type “Unknown Addressee Indicator” to a NDR correctly.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/X.25 test interface <i>cid1</i>. The IUT shall convert the IPM to an AFTN user message and send it over AFTN/X.25 test interface <i>cid1</i> to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN service message of type “Unknown Addressee Indicator” to the IUT that relates to the formerly received message. The IUT shall convert this AFTN service message to a NDR. Verify that a NDR is generated (as specified in the AMHS SARPs, section 3.1.2.3.4.4) and received by AMHS Test Tool via the AMHS test interface <i>trp1</i> with the following elements: • for the report-destination-name the <i>originator-name</i> of the subject AMHS message, • for the subject-identifier the <i>message-identifier</i> of the subject AMHS message, • for the actual-recipient-name the <i>unknown addressee indicator</i> reported with the SVC, • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and • “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i>.
AMHS SARPs reference	3.1.2.3.4.4 (conversion AFTN SVC unknown)
Test class	Normal AMHS communications

CT419 – Incoming AFTN SVC “Unknown Addressee Indicator” without related subject message

CT419	Incoming AFTN SVC “Unknown Addressee Indicator” without related subject message
Test criteria	This test is successful, if the IUT encapsulates a received AFTN service message (SVC) of type “Unknown Addressee Indicator” into an IPM, if the subject message did not pass the gateway before.
Scenario description	From the AMHS Test Tool send an AFTN service message of type “Unknown Addressee Indicator” to the IUT addressing an AMHS user. The AFTN service message shall have a fictitious origin subject message in the message text. Check the output of the IUT at the AMHS transfer port. Verify that the IUT sends an IPM with the addressed AMHS user as recipient. Verify that the IPM contains the original AFTN SVC in the IPM body (ATS-message-text).
AMHS SARPs reference	3.1.2.3.4.4.1.1 b)
Test class	Normal AMHS communications

CT420 – Processing of an incoming SVC QTA RPT Message

CT420	Processing of an incoming SVC QTA RPT Message
Test criteria	This test is successful, if the IUT sends an AFTN user message a second time, if it receives an SVC QTA RPT message.
Scenario description	From the AMHS Test Tool send an ATS message (IPM) to the IUT addressing an AFTN user. The IUT shall convert the message into AFTN format and send it over the AFTN/X.25 test interface to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN service message of type QTA RPT related to the previously received AFTN message. Verify that the IUT does not translate the AFTN service message into an IPM, but processes the QTA RPT so that the previous message is sent to the AFTN user (automatically or by operator intervention) a second time.
AMHS SARPs reference	3.1.2.3.2.1.12
Test class	Normal AMHS communications

CT421 – Probe Conveyance Test

CT421	Probe Conveyance Test
Test criteria	This test is successful, if the IUT (receiving a probe with an AFTN user as intended recipient) generates a DR, if conversion to AFTN is possible or an NDR, if conversion to AFTN is not possible.
Scenario description	From the AMHS Test Tool send a sequence of AMHS probes to the IUT. - Probe 1 shall specify a content-length of 1800 and address an AFTN user recipient reachable via the AMHS/AFTN gateway. - Probe 2 shall specify a content-length of 1800 and address an AFTN user recipient, which is routed by the IUT via the gateway (MTCU), but which can not be mapped onto a valid AFTN address by the MTCU. - Probe 3 shall specify a content-length of 1800 and address two AFTN user recipients, one which can be mapped and one which can not be mapped onto a valid AFTN address. - Probe 4 shall specify a content-length of 10.000 and address an AFTN user recipient reachable via the AFTN/AMHS gateway. - Probe 5 shall specify a content-length of 100.000 and address an AFTN user recipient reachable via the AFTN/MHS gateway. - Probe 6 shall have a recipient argument addressing 512 AFTN users. - Probe 7 shall have a recipient argument addressing more than 512 AFTN users. Check the messages received at the AMHS Test Tool-AMHS interface. Verify that the IUT returns a report for each probe. Check the report contents and determine if it is a DR, NDR or combined report: - A DR shall be returned in response to probe 1. - A NDR shall be returned in response to probe 2. - A DR and NDR (one combined report or two reports) shall be returned in response to probe 3. - Depending on the gateway's capabilities, a DR or NDR shall be returned for probe 4 and 5. - A DR shall be returned for Probe 6. - A NDR shall be returned for Probe 7.
AMHS SARPs reference	3.1.2.3.5.5 (reception of AMHS probe), PDR M4050004, PDR M601003
Test class	Normal AMHS communications

CT422 – Reject an IPM with unsupported content-type

CT422	Reject an IPM with unsupported content-type
Test criteria	This test is successful, if the IUT's gateway component rejects an incoming message of content-type other than IPM 88 and generates a NDR.
Scenario description	From the AMHS Test Tool send a sequence of messages to the IUT via transfer port <i>trp1</i> addressed to an AFTN user recipient. The messages shall have different values for the content-type contained in the MTE. • The 1st message shall contain a <i>built-in content-type</i> value "interpersonal-messaging-1988(22)". • The 2nd message shall contain a <i>built-in content-type</i> value "interpersonal-messaging-1984(2)". • The 3rd message shall contain a <i>built-in content-type</i> value "edi-messaging(35)". • The 4th message shall contain a <i>built-in content-type</i> value "unidentified(0)". All messages shall contain an IPM body with ATS-message-header and ATS-message-text.¹³ Verify that the IUT accepts and converts the 1st message, but rejects 2nd, the 3rd and 4th message. Verify that the IUT returns a NDR for the 2nd, 3rd and 4th message containing: • "unable-to-transfer" for the <i>non-delivery-reason-code</i>, and • "content-type-not-supported" for the <i>non-delivery-diagnostic-code</i>.
AMHS SARPs reference	3.1.2.3.5.1.1
Test class	Normal AMHS communications, Erroneous AMHS parameters

¹³ It is assumed that MTAs on the relay path do not verify the specified content-type against the contained body part(s) and transfer all type of messages towards the gateway (MTCU).

CT423 – Processing of the original-encoded-information-types (EIT)

CT423	Processing of the original-encoded-information-types (EIT)
Test criteria	This test is successful, if the IUT's gateway component evaluates the original-encoded-information-types contained in the incoming ATS message and: • accepts (and converts) the message, if it contains one of those values specified in section 3.1.2.3.5.2.1.1 of the AMHS SARPs, or • rejects the message, if it does not contain any of those values and generates a NDR.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user. The messages shall have the following values for the <i>original-encoded-information-types</i> (EIT) contained in the Message Transfer Envelope (MTE) • The 1st message shall contain <i>built-in-encoded-information-types</i> with value "IA5-text(2)". • The 2nd message shall contain <i>built-in-encoded-information-types</i> with value "unknown(0)". • The 3rd message shall contain <i>extended-encoded-information-types</i> with OID "2.6.3.4.2" for IA5-text information types. • The 4th message shall contain <i>extended-encoded-information-types</i> with OID "2.6.3.4.0" for unknown information types. • The 5th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}. • The 6th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. • The 7th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}. • The 8th message shall contain <i>extended-encoded-information-types</i> with (invalid) OID {id-cs-eit-authority 3}. • The 9th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and (invalid) OID {id-cs-eit-authority 7}. • The 10th message shall contain <i>built-in-encoded-information-types</i> with value "IA5-text(2)" and <i>extended-encoded-information-types</i> with OID "2.6.3.4.2" for IA5-text as well as OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}.

	The messages shall contain a body part corresponding to the (first valid) <i>original-encoded-information-types</i> value. Verify that all messages with valid EIT argument are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/X.25 test interface of the AMHS Test Tool. Verify that all messages with any invalid EIT argument are rejected by the IUT and a NDR is returned via transfer port <i>trp1</i> with the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and • “encoded-information-types-unsupported” for the <i>non-delivery-diagnostic-code</i>.
AMHS SARPs reference	3.1.2.3.5.2.1.1
Test class	Normal AMHS communications and Erroneous AMHS parameters

CT 424 – Incoming IPM with extended body part of type "IA5-text-body-part"

CT424	Incoming IPM with extended body part of type "IA5-text-body-part"
Test criteria	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with extended body part of type "IA5-text-body-part" and converts the IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user. • The first message shall contain an <u>extended</u> body part of type "IA5-text-body-part", which includes an ATS-message-header and ATS-message-text with IA5-text characters. The <i>original-encoded-information-types</i> attribute shall contain <i>extended-encoded-information-types</i> with OID "2.6.3.4.2" (IA5-text). • The second message shall be equal except for the <i>original-encoded-information-types</i>, which has a <u>built-in</u> value for IA5-text(2)¹⁴. • The third message shall be equal to the first, but the <i>repertoire</i> argument in the body shall be different from IA5(5). • The fourth message shall be equal to the first, but the body part data shall contain characters different from IA5String, e.g. special characters of local language – as in German "ä", "ö" and "ü" or in French "é". Verify that the first and second message are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/X.25 test interface of the AMHS Test Tool. Check whether the other messages are converted into AFTN format or rejected by the IUT. In case of rejection, verify that an NDR is returned via transfer port <i>trp1</i> with the following elements: • "unable-to-transfer" for the <i>non-delivery-reason-code</i>, • "content-syntax-error" for the <i>non-delivery-diagnostic-code</i>, and • "unable to convert to AFTN due to unsupported body part type" for the <i>supplementary-information</i>.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 2)
Test class	Normal AMHS communications

¹⁴ It is assumed that an extended IA5-text-body-part can be associated with either a built-in EIT or extended EIT value for IA5-text.

CT425 – Incoming IPM with extended body part type "general-text-body-part" and ISO 646 repertoire

CT425	Incoming IPM with extended body part type "general-text-body-part" and ISO 646 repertoire
Test criteria	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with extended body part type "general-text-body-part" of which the repertoire set description is Basic (ISO 646) and converts the IPM into AFTN format correctly.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user recipient. All messages shall contain an extended body part of type "general-text-body-part", which includes an ATS-message-header and ATS-message-text with general-text data. The <i>original-encoded-information-types</i> shall be set to <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}. The message text (data part) shall include ISO 646 (US-ASCII) characters, only. The parameter argument in the IPM body part shall specify the following character sets: • The 1st message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire. • The 2nd message shall contain character set registration numbers 1 and 5. • The 3rd message shall contain character set registration numbers 2 and 5. • The 4th message shall contain an empty set of character registration. The message text (data part) shall include ISO 646 (US-ASCII – see Table 13) characters, only. Verify that only the first message is accepted by the IUT's gateway component, converted to AFTN format and received at the X.25/AFTN interface of the AMHS Test Tool. Analyze the received AFTN messages with respect to the AFTN message text. Verify that all other messages are rejected by the IUT and an NDR is returned via transfer port <i>trp1</i> with the following elements: • "unable-to-transfer" for the <i>non-delivery-reason-code</i>, • "content-syntax-error" for the <i>non-delivery-diagnostic-code</i>, and • "unable to convert to AFTN due to unsupported body part type" for the <i>supplementary-information</i>.
AMHS SARPs reference	3.1.2.3.5.2.1.4 a) 3)
Test class	Normal AMHS communications and Erroneous AMHS parameters

20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
,	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	
p	q	r	s	t	u	v	w	x	y	z	{		}	~	

Table 13: The ISO 646 (US-ASCII) character set

CT426 – Incoming IPM with extended body part type "general-text-body-part" and ISO 8859-1 repertoire

CT426	Incoming IPM with extended body part type "general-text-body-part" and ISO 8859-1 repertoire
Test criteria	This test is successful, if the IUT's gateway component processes a received ATS message (IPM) with extended body part type "general-text-body-part" of which the repertoire set description is Basic-1 (ISO 8859-1) according to its local AMHS Management Domain policy. <i>Note. – Depending on the local policy of the AMHS Management Domain a received message with extended body part type "general-text-body-part" of which the repertoire set description is Basic-1 (ISO 8859-1) can be converted or rejected.</i>
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user recipient. All messages shall contain an extended body part of type "general-text-body-part", which includes an ATS-message-header and ATS-message-text with general-text data. The <i>original-encoded-information-types</i> shall be set to <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}. The message text (data part) shall include ISO 8859-1 characters (Latin-1, Western Europe – see Table 14). The parameter argument in the IPM body part shall specify the following character sets: • The 1st message shall contain character set registration numbers 1, 6 and 100 which specify the ISO 8859-1 repertoire. • The 2nd message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire. • The 3rd message shall contain an empty set of character registration. The characters used in the message text (data part) shall be equal for all messages. Check, if the messages are converted or rejected by the IUT according to its local policy. In case of conversion, analyze the received AFTN messages with respect to the characters contained in the AFTN message text. In case of message rejection, check, if the NDR returned via transfer port <i>trp1</i> contains the following elements: • "unable-to-transfer" for the <i>non-delivery-reason-code</i>, • "content-syntax-error" for the <i>non-delivery-diagnostic-code</i>, and • "unable to convert to AFTN due to unsupported body part type" for the <i>supplementary-information</i>.

AMHS SARP reference	3.1.2.3.5.2.1.4 a) 4) 3.1.2.3.5.2.1.4 b)
Test class	Normal AMHS communications and Erroneous AMHS parameters

A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
	í	í	í	í	í	í	í	í	í	í	í	í	í	í	í
B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	BA	BB	BC	BD	BE	BF
	±	2	3	~	μ	¶	·	¸	1	2	3	4	5	6	7
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9	CA	CB	CC	CD	CE	CF
	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î
D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	DA	DB	DC	DD	DE	DF
	Ð	Ñ	Ò	Ó	Ô	Õ	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9	EA	EB	EC	ED	EE	EF
	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	FA	FB	FC	FD	FE	FF
	ö	ñ	õ	ö	ö	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

Table 14: The ISO 8859-1 character set

4.5 Gateway Operations (AFTN to AMHS)

CT501 – Convert an AFTN user message to AMHS format

CT501	Convert an AFTN user message to AMHS format
Test criteria	This test is successful, if the IUT converts an AFTN user message to an AMHS message (IPM) correctly.
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of five messages, one for each AFTN priority, i.e. SS, DD, FF, GG, KK. The filing time shall be different for each message and the OHI field shall be empty for all messages¹⁵. Check the IPMs that the AMHS Test Tool receives from the IUT via the AMHS transfer port. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. Check message envelopes and contents. In particular, verify that: - the <i>ATS-message-header</i> and <i>ATS-message-text</i> in the IPM body part has the correct format, - the AFTN message text is correctly inserted in the <i>ATS-message-text</i> field, - the AFTN message priority is correctly inserted in the <i>ATS-message-priority</i> field, - that the IUT has translated the AFTN priority indicator and inserted the correct priority in the message transfer envelope (MTE) – see - Table 15, - the addressee indicator is correctly translated in the corresponding AMHS OR address and entered as <i>primary-recipient</i> in the IPM heading and as <i>recipient-name</i> in the MTE, - the AFTN originator is translated in the AMHS OR address which was registered for identification of the AFTN originator in the AMHS and allocated to the elements <i>originator</i> (MTE), <i>originator-name</i> and the sub-component user of the element <i>this-IPM</i> (IPM heading), - the filing time is correctly inserted in the <i>ATS-message-header</i>.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications

¹⁵ Conversion of the optional-heading-information element is subject to another test.

AFTN Priority Indicator	AMHS MTE priority	AMHS ATS-Message-Priority priority-indicator
SS	Urgent	SS
DD	Normal	DD
FF	Normal	FF
GG	non-urgent	GG
KK	non-urgent	KK

Table 15: Mapping of AFTN Priority Indicator for the Basic ATS Message Handling Service¹⁶

¹⁶ The mapping of the AFTN priority indicator is specified in table 3.1.2-7 of the AMHS SARPs

CT502 – Convert an AFTN user message containing optional heading information

CT502	Convert an AFTN user message containing optional heading information
Test criteria	This test is successful, if the IUT converts an AFTN user message containing optional heading information (OHI) correctly into an AMHS message (IPM).
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of • a normal (non-SS) priority AFTN message containing (short) OHI text, • a normal (non-SS) priority AFTN message containing OHI filling the originator line, • an SS priority AFTN message containing (short) OHI text, • an SS priority AFTN message containing OHI filling the originator line. Check the IPMs transferred via the AMHS transfer port. Verify that the IUT has converted the messages correctly. Check envelopes and contents. In particular, verify the correct format of the ATS-message-header.
AMHS SARPs reference	3.1.2.3.4.2.1.6
Test class	Normal AMHS communications

CT503 – Generate an AFTN service message of the type “Unknown Addressee Indicator”

CT503	Generate an AFTN service message of the type “Unknown Addressee Indicator”
Test criteria	This test is successful, if the IUT returns an AFTN service message of the type “Unknown Addressee Indicator”, if the translation of addressee indicator fails.
Scenario description	From the AMHS Test Tool send an AFTN messages over the AFTN/X.25 test interface to the IUT. The AFTN message shall contain an addressee indicator which can not be mapped by the IUT. Verify that the IUT does not convert the received AFTN message into an AMHS message (IPM), but returns an AFTN service message of the type “Unknown Addressee Indicator” over the AFTN/X.25 test interface.
AMHS SARPs reference	3.1.2.3.5.4 (NDR conversion)
Test class	Normal AMHS communications

CT504 – Incoming AFTN user message with unknown originator indicator

CT504	Incoming AFTN message with unknown originator indicator
Test criteria	This test is successful, if the IUT informs its control position, if during the conversion process the translation of the originator indicator fails.
Scenario description	From the AMHS Test Tool send an AFTN messages over the AFTN/X.25 test interface to the IUT. The AFTN message shall contain an originator indicator which is unknown in the IUT. Verify that the IUT does not send any message via the X.25/AFTN or AMHS interface but informs its control position that the gateway is not able to translate the originator indicator.
AMHS SARPs reference	3.1.2.3.4.2.1.4.1
Test class	Erroneous AMHS parameters

CT505 – Convert a receipt notification

CT505	Convert a receipt notification
Test criteria	This test is successful, if the IUT converts a received IPN containing a receipt notification (RN) to an AFTN acknowledgement correctly.
Scenario description	From the AMHS Test Tool send an AFTN user message with priority “SS” via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent as an IPM to the AMHS Test Tool via transfer port <i>trp1</i>. Upon receipt of the IPM the AMHS Test Tool returns a RN. Verify that the IUT converts the received RN correctly into an AFTN acknowledgement. In particular, verify that: the <i>originator-name</i> is translated into the <i>Originator Indicator</i> of the AFTN acknowledgement, the <i>receipt-time</i> forms the <i>Filing Time</i> of the AFTN acknowledgment, logged elements of the previously handled <i>subject AFTN message</i> are used and inserted correctly into the AFTN acknowledgment.
AMHS SARPs reference	3.1.2.3.5.3 (RN conversion),
Test class	Normal AMHS communications

CT506 – Incoming non-receipt notification

CT506	Incoming non-receipt notification
Test criteria	This test is successful, if the IUT reports to its control position and stores the message, if it receives an IPN containing a NRN addressed to an AFTN user.
Scenario description	From the AMHS Test Tool send an AFTN message with priority “SS” via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port <i>trp1</i>. Upon receipt of the AMHS message the AMHS Test Tool returns a NRN. Verify that the IUT behaves as specified in the AMHS SARPs, section 3.1.2.3.5.1.2, i.e. • logs the error situation and reports to a control position, and • stores the message for appropriate processing at the control position.
AMHS SARPs reference	3.1.2.3.5.1.2 c) (processing of NRN)
Test class	Erroneous AMHS parameters

CT507 – Generate a NDR as a result of misrouted RN

CT507	Generate a NDR as a result of misrouted RN
Test criteria	This test is successful, if the IUT rejects a misrouted IPN containing a receipt notification (RN) and returns a NDR.
Scenario description	From the AMHS Test Tool send a RN to the IUT via transfer port <i>trp1</i> addressed to an AFTN user. The RN contains a fictitious value for the subject-ipm (subject AFTN message) and is not related to any message that had previously passed the IUT. Verify that the IUT does not transfer any AFTN acknowledgement over the AFTN/X.25 test interface to the AMHS Test Tool, but generates a NDR and sends it via the transfer port <i>trp1</i> to the AMHS Test Tool. Verify that the NDR contains the following elements as specified in the AMHS SARPS, section 3.1.2.3.5.3.1.1: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>; • “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>; and • “unable to convert RN to AFTN ACK service message due to misrouted RN” for the <i>supplementary-information</i>.
AMHS SARPs reference	3.1.2.3.5.3.1.1
Test class	MHS procedural errors

CT508 – Convert a non-delivery report (NDR)

CT508	Convert a non-delivery report (NDR)
Test criteria	This test is successful, if the IUT converts a received NDR with a <i>non-delivery-diagnostic-code</i> of the value “unrecognised-OR-name” to an AFTN service message (SVC) of the type “Unknown Addressee”.
Scenario description	From the AMHS Test Tool send an AFTN message via the AFTN/X.25 test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port <i>trp1</i>. The AMHS Test Tool shall return a NDR related to the received message and with a <i>non-delivery-diagnostic-code</i> of the value “unrecognised-OR-name”. Verify that the IUT converts the received NDR into an AFTN service message (SVC) and sends it over the AFTN/X.25 test interface to the AMHS Test Tool. In particular, verify that: - the <i>actual-recipient-name</i> elements (provided with the <i>per-recipient-fields</i> in the Report Transfer Content) are converted into AFTN addresses which form the <i>unknown-addressee-indicators</i> in the text of the AFTN SVC, - priority indicator, addressee indicator, origin and the first-address-line of the subject message are taken from log entries made for the handled subject message, and - the filing time is generated correctly by the gateway component of the IUT. - the originator indicator of the service message is the AFTN Address of the AFTN Component of the AFTN/AMHS Gateway
AMHS SARPs reference	3.1.2.3.5.4 (NDR conversion), 3.1.2.3.5.4.2.7
Test class	Normal AMHS communications

CT509 – NDR conversion process failures

CT509	NDR conversion process failures
Test criteria	This test is successful, if the IUT reports to its control position, whenever an error occurs in the NDR conversion process.
Scenario description	From the AMHS Test Tool send three AFTN messages via the X.25/AFTN interface to the IUT. The messages shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port <i>trp1</i>. The AMHS Test Tool shall return a NDR for each received message. • The 1st NDR shall contain a <i>non-delivery-diagnostic-code</i> different from “unrecognised-OR-name”. • The 2nd NDR shall contain an unknown address in the <i>actual-recipient-name</i> element. • The 3rd NDR shall refer to a fictitious subject message that did not pass the gateway before. Check the output of the IUT at the control position. Verify that for each NDR the IUT behaves as specified in the relevant sections of the AMHS SARPs, i.e. • logs the non-delivery situation and reports to a control position, and • stores the non-delivery report for appropriate processing at the control position.
AMHS SARPs reference	3.1.2.3.5.4.1.1, 3.1.2.3.5.4.1.3
Test class	Erroneous AMHS parameters

4.6 Naming and Addressing

CT601 – Address conversion from AMHS CAAS- and XF-addresses to AFTN addresses

CT601	Address conversion from AMHS CAAS- and XF-addresses to AFTN addresses
Test criteria	This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators correctly. Conversion shall be correct for both types, i.e. CAAS and XF-addresses. <i>Note:- The test cases in which the address conversion AMHS-AFTN-AMHS leads to asymmetric results are covered in CT607.</i>
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i> to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port <i>cid1</i>. • The 1st ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing an AFTN user in AFTNLAND-1. Note that both PRMDs (AMHSLAND-1 and AFTNLAND-1) implement the CAAS with one single organisation-name value for all location indicators within the PRMD. • The 2nd ATS message shall be sent via MTA-2 with originator from AMHSLAND-2 addressing an AFTN user in AFTNLAND-2. Note that both PRMDs (AMHSLAND-2 and AFTNLAND-2) implement the CAAS with multiple organisation-name values for different sets of location indicators within the PRMD. • The 3rd ATS message shall be sent via MTA-3 with originator from AMHSLAND-3 addressing an AFTN user in AFTNLAND-3. Note that both PRMDs (AMHSLAND-3 and AFTNLAND-3) implement the XF addressing scheme. • The 4th ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing three AFTN users, one in AFTNLAND-1, one in AFTNLAND-2 and one in AFTNLAND-3. All messages shall have an IA5-text body part with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty¹⁷. Check the messages received at the X.25/AFTN interface. Verify that the IUT was able to map all AMHS O/R addresses to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages.

¹⁷ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

AMHS SARP reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Normal AMHS communications

CT602 – Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses

CT602	Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses
Test criteria	This test is successful, if the IUT that converts an AFTN user message to AMHS translates the AFTN originator indicator and all addressee indicators into correct AMHS addresses, which may be either XF- or CAAS addresses.
Scenario description	From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/X.25 port <i>cid1</i> to the IUT addressing different AMHS users reachable via the AMHS transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. • The 1st AFTN user message shall be sent with originator from AFTNLAND-1 addressing an AMHS user in AMHSLAND-1. Note that both PRMDs (AFTNLAND-1 and AMHSLAND-1) implement the CAAS with one single organisation-name value for all location indicators within the PRMD. • The 2nd AFTN user message shall be sent with originator from AFTNLAND-2 addressing an AMHS user in AMHSLAND-2. Note that both PRMDs (AFTNLAND-2 and AMHSLAND-2) implement the CAAS with multiple organisation-name values for different sets of location indicators within the PRMD. • The 3rd AFTN user message shall be sent with originator from AFTNLAND-3 addressing an AMHS user in AMHSLAND-3. Note that both PRMDs (AFTNLAND-3 and AMHSLAND-3) implement the XF addressing scheme. • The 4th AFTN user message shall be sent with originator from AFTNLAND-1 addressing three AMHS users, one in AMHSLAND-1, one in AMHSLAND-2 and one in AMHSLAND-3. Check the messages received at AMHS transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that the IUT was able to map all AFTN originator and addressee indicators to AMHS O/R addresses. Verify the correct AMHS O/R addresses in the originator and recipient fields of both MTE and IPM headings.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.4.2.1.4.1 (Translation of the AFTN originator indicator) 3.1.2.3.4.2.1.4.2 (Translation of the AFTN addressee indicator)
Test class	Normal AMHS communications

CT603 – Reject an IPM with invalid recipient address (CAAS)

CT603	Reject an IPM with invalid recipient address (CAAS)
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type CAAS which can not be mapped to a valid AFTN addressee indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user in the PRMD “AFTNLAND-1” that implements the CAAS. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty¹⁸. • The 1st ATS message shall contain a recipient address with an invalid <i>common-name</i> attribute, that contains 9 letters, e.g. “BAAAF~~T~~ABC”. • The 2nd ATS message shall contain a recipient address with an invalid <i>common-name</i> attribute, that contains only 6 letters, e.g. “BAAAF~~T~~”. • The 3rd ATS message shall contain a recipient address with a valid <i>organizational-unit-names</i> attribute “BAAA”, but an <i>empty common-name attribute</i>. • The 4th ATS message shall contain a recipient address with a valid <i>common-name</i> attribute “BAAAF~~T~~AA”, but an <i>empty organizational-unit-names attribute</i>. • The 5th ATS message shall contain a recipient address with a valid <i>common-name</i> attribute “BAAAF~~T~~AA”, but an <i>organizational-unit-names</i> attribute that is different from the first 4 letters of the <i>common-name</i> attribute, e.g. “BAAX”. • The 6th ATS message shall contain a recipient address with a valid <i>common-name</i> attribute “BAAAF~~T~~AA”, and correct <i>organizational-unit-names</i> attribute “BAAA” but an <i>empty organization-name attribute</i>. Verify that for each message a NDR is generated by the IUT with the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and • “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i>.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

¹⁸ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

CT604 – Reject an IPM with invalid recipient address (XF like)

CT604	Reject an IPM with invalid recipient address (XF like)
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type XF which can not be mapped to a valid AFTN addressee indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user in the PRMD “AFTNLAND-3” that implements the XF addressing scheme. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty¹⁹. • The 1st ATS message shall contain a recipient address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFTABC”. • The 2nd ATS message shall contain a recipient address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFT”. • The 3rd ATS message shall contain a recipient address with the value “AFTN” in the <i>organization-name</i> attribute, but an <i>empty organizational-unit-names</i> attribute. • The 4th ATS message shall contain an originator address with an <i>empty organizational-name</i> attribute and a valid <i>organizational-unit-names</i> attribute, e.g. “BCAAFTAA”. • The 5th ATS message shall contain an originator address with an invalid <i>organization-name</i> attribute, e.g. “ATFM” and a valid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFTAA” Verify that for each message a NDR is generated by the IUT with the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and • “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i>.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

¹⁹ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

CT605 – Reject an IPM with invalid originator address (CAAS like)

CT605	Reject an IPM with invalid originator address (CAAS like)
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type CAAS which can not be mapped to a valid AFTN originator indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user reachable via the AFTN/X.25 port <i>cid1</i>. All messages shall be originated from the PRMD “AMHSLAND-1” which implements the CAAS. They shall have a valid recipient address for the PRMD “AFTNLAND-1”, but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty²⁰. • The 1st ATS message shall contain an originator address with an invalid <i>common-name</i> attribute, e.g. “AAAAMHABC”. • The 2nd ATS message shall contain an originator address with an invalid <i>common-name</i> attribute that contains only 6 letters, e.g. “AAAAMH”. • The 3rd ATS message shall contain an originator address with a valid <i>organizational-unit-names</i> attribute “AAAA”, but an empty common-name attribute. • The 4th ATS message shall contain an originator address with a valid <i>common-name</i> attribute “AAAAMHAA”, but an empty organizational-unit-names attribute. • The 5th ATS message shall contain an originator address with a valid <i>common-name</i> attribute “AAAAMHAA”, but an <i>organizational-unit-names</i> attribute that is different from the first 4 letters of the <i>common-name</i> attribute, e.g. “AAAX”. • The 6th ATS message shall contain an originator address with a valid <i>common-name</i> attribute “AAAAMHAA” and correct <i>organizational-unit-names</i> attribute “AAAA”, but an empty organization-name attribute. Verify that for each message a NDR is generated by the IUT with the following elements: • “unable-to-transfer” for the <i>non-delivery-reason-code</i>, • “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>, and • “unable to convert to AFTN due to unrecognized originator O/R address” for the <i>supplementary-information</i>.

²⁰ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

CT606 – Reject an IPM with invalid originator address (XF like)

CT606	Reject an IPM with invalid originator address (XF like)
Test criteria	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type XF which can not be mapped to a valid AFTN originator indicator.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp3</i> to the IUT addressing an AFTN user reachable via the AFTN/X.25 port <i>cid1</i>. All messages shall be originated from the PRMD “AMHSLAND-3” which implements the XF addressing scheme. They shall have a valid recipient address for the PRMD “AFTNLAND-3”, but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty²¹. • The 1st ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHABC”. • The 2nd ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMH”. • The 3rd ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an <i>empty organizational-unit-names</i> attribute. • The 4th ATS message shall contain an originator address with an <i>empty organization-name attribute</i> and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”. • The 5th ATS message shall contain an originator address with an invalid <i>organization-name</i> attribute, e.g. “UNKNOWN” and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”.
AMHS SARPs reference	3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator)
Test class	Erroneous AMHS parameters

²¹ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

CT607 – Asymmetric address conversion from AMHS CAAS- and XF- recipient addresses to AFTN addresses

CT607	Asymmetric address conversion from AMHS CAAS- and XF- recipient addresses to AFTN addresses
Test criteria	This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators although the re-conversion of the AFTN addressee indicators lead to O/R addressees different from the original recipient O/R addresses (asymmetric). The asymmetric recipient address conversion shall be logged and reported to the Control Position.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port <i>cid</i>. - The 1st ATS message shall be sent via MTA-1 with correct originator from AMHSLAND-1 containing CAAS and XF recipient addresses which are translated into AFTN addresses of which the retranslations do not deliver the same AMHS addresses²²: /C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=BA-REGION/OU1=BBAA/CN=BBAAFTAA, /C=XX/ADMD=ICAO/PRMD=AFTNLAND-2 /O=AFTN/OU1=BCAAFTAA - The 2nd ATS message shall be sent via MTA-1 with correct originator from AMHSLAND-1 containing a CAAS recipient address with a PRMD value of an MD which has implemented the XF addressing scheme and a valid XF recipient address with a PRMD value of an MD which has implemented the CAAS addressing scheme: /C=XX/ADMD=ICAO/PRMD=AFTNLAND-3 /O=AFTN/OU1=BCAA/CN=BCAAFTAA, /C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=AFTN/OU1=BAAAFATAA All messages shall have an IA5-text body with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty²³.

²² The AMHS addresses are listed in Table 10.

²³ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

	Check the messages received at the AFTN/X.25 interface. Verify that the IUT was able to convert all AMHS O/R addresses to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages. Check that conversion asymmetries of the recipient addresses are logged and reported to the Control Position.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator) PDR M7100001
Test class	Normal AMHS communications

CT608 – Asymmetric address conversion from AMHS CAAS- and XF- originator addresses to AFTN addresses

CT608	Asymmetric address conversion from AMHS CAAS- and XF- originator addresses to AFTN addresses
Test criteria	This test is successful, if the IUT, when converting an AMHS message (IPM) to an AFTN message, translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators, although the re-conversion of the AFTN originator indicator leads to an originator O/R address different from the original O/R address (asymmetric). The asymmetric originator address conversion shall be logged and reported to the Control Position.
Scenario description	From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports <i>trp1</i> and <i>trp3</i> to the IUT, addressing different AFTN users reachable via the AFTN/X.25 port <i>cid1</i>. - The 1st ATS message shall be sent via MTA-1 with a CAAS originator address which is translated into an AFTN address of which the retranslation does not deliver the same AMHS address²⁴: (1) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AA-REGION/OU1=ABAA/CN=ABAAMHAA The recipient shall be an AFTN user in AFTNLAND-1. - The 2nd ATS message shall be sent via MTA-1 with a XF originator address which is translated into an AFTN address of which the retranslation does not deliver the same AMHS address: (2) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AFTN/OU1=ACCCMHAA The recipient shall be an AFTN user in AFTNLAND-1. - The 3rd ATS message shall be sent via MTA-3 with a CAAS originator address with a PRMD value of an MD which has implemented the XF addressing scheme:: (3) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-3 /O=AFTN/OU1=ACCC/CN=ACCCMHAA The recipient shall be an AFTN user in AFTNLAND-1.

²⁴ Originator and recipient addresses in the IPM heading may be empty. According to SARPs 3.1.2.3.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

	The 4th ATS message shall be sent via MTA-1 with a XF originator address with a PRMD value of an MD which has implemented the CAAS addressing scheme:: (4) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AFTN/OU1=AAAAMHAA The recipient shall be an AFTN user in AFTNLAND-1. All messages shall have an IA5-text body part with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty. Check the messages received at the AFTN/X.25 interface. Verify that the IUT was able to convert all AMHS O/R addresses²⁵ to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages. Check that the conversion asymmetries of the originator addresses are logged and reported to the Control Position.
AMHS SARPs reference	3.1.2.1.5 (Naming and Addressing Principles) 3.1.2.3.5.2.2.6.1 (Generation of the AFTN originator indicator) 3.1.2.3.5.2.2.6.2 (Generation of the AFTN addressee indicator) PDR M7100001
Test class	Normal AMHS communications

²⁵The AMHS addresses are listed in Table 10.

4.7 Transfer, delivery and handling of Non-Delivery Reports (NDR)

CT701 – Transfer a non-delivery report (NDR)

CT701	Transfer a non-delivery report (NDR)
Test criteria	This test is successful, if the IUT transfers (forwards) non-delivery reports containing the standardized reason and diagnostic codes correctly.
Scenario description	From the AMHS Test Tool send a set of non-delivery reports to the IUT transfer port <i>trp1</i> to be forwarded to another domain. The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 16 below). The report transfer envelope shall contain a remote recipient address (Report Destination) reachable via transfer port <i>trp2</i>. The reports may contain fictitious values for those fields which are normally related to a subject message, like subject-MTS-identifier and encoded-information types and originally intended recipients. Monitor the outcome of IUT transfer port <i>trp2</i>. Verify that: • all reports are routed correctly via transfer port <i>trp2</i>, and • the reason and diagnostic codes of the forwarded report are identical to those contained in the original report.
AMHS SARPs reference	
Test class	Normal AMHS communications

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CT701M01	16	0	0 – 15
CT701M02	31	0	0 – 30
CT701M03	31	1	0 – 30
CT701M04	5	1	46 – 50
CT701M05	3	2	8 – 10
CT701M06	7	2	19 – 25
CT701M07	1	3	31
CT701M08	14	4	32 – 45
CT701M09	1	5	not used
CT701M10	1	6	not used

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CT701M11	1	7	not used
CT701M12	28	8	51 – 78

Table 16: AMHS non-delivery-reason-codes and non-delivery-diagnostic-codes used in test messages of CT701 – CT703²⁶

Note 1:- The non-delivery-diagnostic-code is an optional element and, for example, not contained in test messages CT701M09, CT701M10 and CT701M11.

Note 2:- Depending on the level of service implemented by the IUT the range of valid non-delivery-reason-codes as well as non-delivery-diagnostic-codes could be different:

Level of Service	ISO/IEC Version	Reason Code Range	Diagnostic Code Range
Basic	ISO/IEC 10021-4:1990	0 – 7	1 – 49
Extended	ISO/IEC 10021-4:1999	0 – 8	1 – 78

²⁶ Every standardized reason code (0 ... 8) and every standardized diagnostic code (0 ... 78) is contained at least once in the test messages.

CT702 – Transfer a non-delivery report (NDR) to an AMHS user

CT702	Transfer a non-delivery report (NDR) to an AMHS user
Test criteria	This test is successful, if the IUT delivers non-delivery reports containing the standardized reason and diagnostic codes to an AMHS user correctly
Scenario description	From the AMHS Test Tool send a set of non-delivery reports to the IUT transfer port <i>trp1</i> to be forwarded to a directly attached AMHS user. The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 16). The report transfer envelope shall contain the recipient address of an AMHS user connected to the IUT. The reports may contain fictitious values for those fields which are normally related to a subject message, like subject-MTS-identifier and encoded-information types and originally intended recipients. Monitor the reports received at the AMHS user agent. Verify that: • all reports are delivered to the AMHS user agent, and • the reason and diagnostic codes of the delivered reports are identical to those contained in the reports sent from the AMHS test tool.
AMHS SARPs reference	
Test class	Normal AMHS communications

Note:- Note 2 of CT701 applies also to CT702.

CT703 – Handling of received non-delivery report (NDR) in the AFTN/AMHS gateway

CT703	Handling of received non-delivery report (NDR) in the AFTN/AMHS gateway
Test criteria	This test is successful, if the IUT upon reception by the MTCU of an AMHS non-delivery report logs the error situation and reports to the control position, if the report does not refer to any previously generated subject message or contains a <i>non-delivery-diagnostic-code</i> value other than “unrecognised-OR-name(0)”.
Scenario description	From the AMHS Test Tool send a set of non-delivery reports to the IUT addressed to an AFTN user reachable via the AFTN/AMHS gateway. The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 16). The report transfer envelope shall contain the recipient address of an AFTN user reachable via the IUT’s AFTN/AMHS gateway. The reports relate to fictitious subject messages that have never been generated by the MTCU. Monitor the events at the Control Position. Verify that the IUT logs the error situation and reports to the control position for every received NDR.
AMHS SARPs reference	
Test class	Normal AMHS communications

Note:- Note 2 of CT701 applies also to CT703.

CT704 – Transfer a NDR containing non-standard reason or diagnostic codes

CT704	Transfer a NDR containing non-standard reason or diagnostic codes
Test criteria	This test is successful, if the IUT transfers non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411).
Scenario description	From the AMHS Test Tool send several NDRs to the IUT transfer port <i>trp1</i> to be forwarded to a recipient address reachable via transfer port <i>trp2</i>. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes: • CT704M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT704M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT704M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT704M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>. • CT704M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>. • CT704M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>. Monitor the outcome of IUT transfer port <i>trp2</i>. Verify that: • all reports are routed correctly via transfer port <i>trp2</i>, and • the reason and diagnostic codes of the forwarded report are identical to those contained in the original report.
AMHS SARPs reference	
Test class	Erroneous AMHS parameters

CT705 – Deliver a NDR containing non-standard reason or diagnostic codes to an AMHS user agent

CT704	Deliver a NDR containing non-standard reason or diagnostic codes to an AMHS user agent
Test criteria	This test is successful, if the IUT delivers non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411) to an AMHS user agent.
Scenario description	From the AMHS Test Tool send several NDRs to the IUT transfer port <i>trp1</i> to be forwarded to a directly attached AMHS user. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes: • CT705M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT705M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT705M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT705M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>. • CT705M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>. • CT705M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>. Verify that all NDRs are delivered to the AMHS user agent. Check the contained reason and diagnostic codes (if any). Verify that no misleading information is presented to the AMHS user.
AMHS SARPs reference	
Test class	Erroneous AMHS parameters

CT706 – Handling of NDR containing non-standard reason or diagnostic codes in the AFTN/AMHS gateway

CT706	Handling of NDR containing non-standard reason or diagnostic codes in the AFTN/AMHS gateway
Test criteria	This test is successful, if the IUT upon reception by the MTCU of an AMHS non-delivery report logs the error situation and reports to the control position, if the NDR contains non-standard reason or diagnostic codes.
Scenario description	From the AMHS Test Tool send several AMHS non-delivery reports to the IUT addressed to an AFTN user reachable via the AFTN/AMHS gateway. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes: • CT706M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT706M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT706M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>. • CT706M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>. • CT706M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>. • CT706M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>. Monitor the events at the Control Position. Verify that the IUT logs the error situation and reports to the control position for every received NDR.
AMHS SARPs reference	
Test class	Erroneous AMHS parameters

--- END ---

ANNEX C

Test Procedure
for
ATN Router Connection Test

ANNEX C

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	11/04/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates – change of document version number	all

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1 Introduction

- 1.1 This document describes the test procedure for the Ground-Ground (G/G) Aeronautical Telecommunication Network (ATN) router connection, up to 3 ATN router interconnections.

2 References

- [1] Asia/Pacific Regional ATN G/G Router ICD for ISO/IEC 8202 Sub-Network.
- [2] ASIA/PAC Interface Control Document (ICD) for ATN G/G Router
- [3] Test Plan for AMHS Technical Trial between Hong Kong, China and Japan.
- [4] “Technical Memorandum of Cooperation between Engineering & Systems Division, Civil Aviation Department, Hong Kong China and Operations and Flight Inspection Division, Civil Aviation Bureau, Ministry of Land, Infrastructure and Transport, Japan: AMHS Trials and Service between Japan and Hong Kong, China”, February 2003. (Amended 24 August 2004)

3 Test Overview and Scope

- 3.1 A joint ATN Router Connection Test between AMHSLAND1 and AMHSLAND2 using a 9.6kbps X.25 PSDN (packet-switched data network) circuit.
- 3.2 An ATN Router Connection Test is scheduled to verify the connectivity, interoperability, data relaying/routing and redundancy capabilities (where applicable) of the ATN Ground-Ground routers in AMHSLAND1 and AMHSLAND2.
- 3.3 The ATN Router Connection Test will also confirm that the functions of the AMHSLAND1 and AMHSLAND2 ATN routers were configured in preparation for more than 2 routers tests.
- 3.4 The system configuration for the test is shown in

Figure 3. Routers in AMHSLAND1 and AMHSLAND2 are linked by an X.25 virtual circuit (VC) over a leased line connection (e.g.64 kbps).

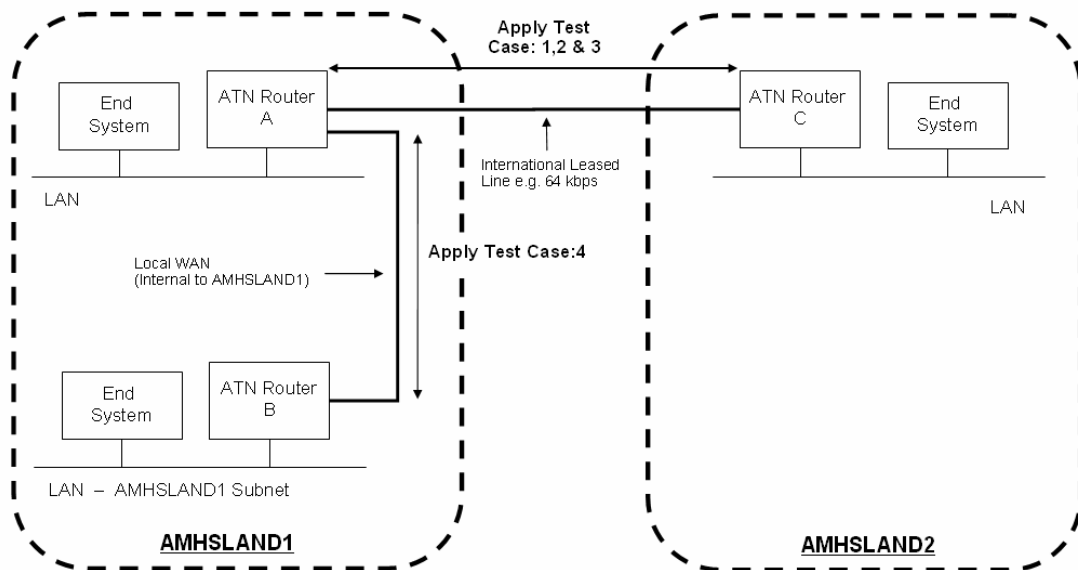


Figure 3 ATN Router Connection Test Configuration

- 3.5 To test data relay and routing functions, CLNP Echo Request (ERQ) Network Protocol Data Units (NPDU) will be generated by the routers and End Systems. To support these tests, all Intermediate Systems shall be capable of generating CLNP ERQ PDUs, and all Intermediate Systems and End Systems shall be capable of transmitting CLNP Echo Response (ERP) PDUs in response to the receipt of ERQ PDUs. Further, it is desirable that End Systems be capable of generating CLNP ERQ PDUs. Execution of some test items is contingent on End Systems' capabilities.
- 3.6 Since both AMHSLAND1 and AMHSLAND2 are ATN backbone sites, the proper updating of their routing tables should be tested in detail. This will ensure that the router could relay the data received from its counterpart to another router either within or outside its own domain/ATN site.
- 3.7 A summary of test items for the ATN Router Connection Test is shown in Table 17.

Table 17 Summary of Test Items for ATN Router Connection Test

No.	Test Item	Details
1	Router Connection Establishment and Maintenance	Establish LAPB, X.25 VC and IDRP connections between routers. Exchange of KEEPALIVE PDUs to maintain IDRP connection.
2	NPDU Relay	Tests to confirm CLNP Echo function of routers, correct NPDU relay, and validation of handling of PDUs with invalid security option parameter.
3	Router end-to-end tests	IDRP route addition/deletion, carrier medium failure/restoration and router failure/recovery.
4	ATN router environment tests	Multiple router route addition/deletion, carrier medium failure/restoration and router failure/recovery in three-domain configurations.

4 Communication Parameters

- 4.1 The proposed communication parameters for the connection between the routers of AMHSLAND1 and AMHSLAND2 are listed in Table 18.
- 4.2 The proposed CLNP communication parameters for the End Systems are listed in Table 19. It is proposed to use the NSAP addresses of the AMHS systems that will be used in actual operation for the ES NSAP addresses.

5 Schedule and Test Item Overview

- 5.1 The test items and planned schedule are shown in Table 20.

Table 18 Router Communication Parameters

Protocol	Item No.	Item	Parameter		Note
			Router (AMHSLAND1)	Router (AMHSLAND2)	
	1.1	NSAP/NET	ROUTER A: 47.0027.81.81524A.00.010101.0302.000000000000.00 ROUTER B: 47.0027.81.854b00.00.010101.0302.000000000000.00	ROUTER C: 47.0027.81.815648.00.010101.0202.0202.012A.0100.00	1
CLNP (RPDU)	2.1	Priority	14	14	2
IDRP	3.1	NLRI	ROUTER A: 47.0027.81.81524A.00.010101 ROUTER B: 47.0027.81.854b00.00.010101	ROUTER C: 47.0027.81.815648.00.010101	
	3.2	RDI	ROUTER A: 47.0027.81.81524A.00.010101 ROUTER B: 47.0027.81.854b00.00.010101	ROUTER C: 47.0027.81.815648.00.010101	
	3.3	SecurityRegistrationID	06 04 2B 1B 00 00	06 04 2B 1B 00 00	2
	3.4	Tag Set Name	07 (ATSC Class Security Tag Set)	07 (ATSC Class Security Tag Set)	2
	3.5	ATSC Class	Class C	Class C	2
	3.6	Holding Time	180 sec	180 sec	2
	3.7	KEEPALIVE Send Timer	60 sec	60 sec	2, 3
	3.8	OPEN PDU Transmission	ROUTER A: AMHSLAND1-AMHSLAND2 : OPEN-PDU send ROUTER A: local circuit: OPEN-PDU send ROUTER B: OPEN-PDU receive	ROUTER C: AMHSLAND2 -AMHSLAND1: OPEN-PDU receive ROUTER C: local circuit: OPEN-PDU send	

Note 1: Compliant with Asia/Pacific ATN addressing plan.

Note 2: For all routers used in tests.

Note 3: The value of the KEEPALIVE send timer is the holding timer value divided by 3.

Table 19 Router Communication Parameters (continued)

Protocol	Item No.	Item	Parameter		Note
			Router (AMHSLAND1)	Router (AMHSLAND2)	
X.25	4.1	DTE Address	ROUTER A AMHSLAND1- AMHSLAND2 : 44442000023903 ROUTER A local circuit: 44442000023903 ROUTER B local circuit: 44440110110202	ROUTER C AMHSLAND1- AMHSLAND2 : 48404701021800 ROUTER C local circuit: local matter	
	4.2	LCGN	0	0	4
	4.3	LCN	10	10	4
	4.4	Packet Size	1024	1024	4
	4.5	Window Size	7	7	4
	4.6	Window Size Negotiation	Yes	Yes	4
	4.7	CR Packet Transmission	ROUTER A AMHSLAND1- AMHSLAND2 : Caller (CR send) ROUTER A local circuit: Caller (CR send) ROUTER B local circuit: Called (CR receive)	ROUTER C AMHSLAND1- AMHSLAND2 : Called (CR receive) ROUTER C local circuit: Caller (CR send)	
	4.8	Use of SQ	Yes	Yes	4
	4.9	Packet Sequence	Modulo 8	Modulo 8	4
	4.10	Packet Negotiation	Yes	Yes	4
	4.11	D Bit	OFF	OFF	4
	4.12	M Bit	Yes	Yes	4
	4.13	Restart Request Retransmission Count (R20)	1	1	4
	4.14	Reset Request Retransmission (R22)	1	1	4
	4.15	Clear Request Retransmission Count (R23)	1	1	4
	4.16	Restart Request Timer (T20)	180 sec	180 sec	4
	4.17	DTE Call Request timer (T21)	200 sec	200 sec	4
	4.18	Reset Confirmation Timer (T22)	180 sec	180 sec	4
	4.19	DTE Clear Confirmation Timer (T23)	180 sec	180 sec	4

Note 4: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Table 20 Router Communication Parameter (continued)

Protocol	Item No.	Item	Parameter		Note
			Router (AMHSLAND1)	Router (AMHSLAND2)	
LAPB	5.1	Address	ROUTER A AMHSLAND1-AMHSLAND2 : 03 ROUTER A local circuit: 03 ROUTER B local circuit: 01	ROUTER C AMHSLAND1-AMHSLAND2 : 01 ROUTER C local circuit: local matter	
	5.2	Max Outstanding Number	7	7	5
	5.3	Idle Channel State Timer (T3)	60 sec	60 sec	5, 6
	5.4	ACK Receipt Timer (T1)	3 sec	3 sec	5, 7
	5.5	Frame Retransmission Count	5	5	5
	5.6	Maximum Number of bits in I-Frame (N1)	8248	8248	5, 8
	5.7	Frame Sequence	Modulo 8	Modulo 8	5
Physical	6.1	Interface	X.21/V.11 (Line Speed: 64 kbps)	V.11 (Line Speed: 64 kbps)	5
	6.2	Clock	Local Matter	Local Matter	5

Note 5: For AMHSLAND1-AMHSLAND2 circuit. Parameters for local circuits used in more than 2 routers tests are a local matter.

Note 6: APAC ROUTER ICD (ref. [1]) specifies router A: 18–60 seconds, router B: 12–60 seconds.

Note 7: APAC ROUTER ICD (ref. [1]) specifies 6 sec, based on 9,600bps line speed and 256 byte packets.

Note 8: Value depends on the max. X.25 packet size. $N1 = \text{packet header size (3)} + \text{packet size (bytes)} + \text{LAPB address part (1)} + \text{LAPB control part (1)} + \text{LAPB FCS part (2)}$ in BITS. So if the packet size is 1024 bytes, then $N1$ is $(3 + 1024 + 1 + 1 + 2) * 8 = 8248$ bits.

Table 21 End System CLNP Communication Parameters

Protocol	Item No.	Item	Parameter	
			Router (AMHSLAND1)	Router (AMHSLAND2)
	7.1	NSAP	AMHSLAND1 ES: 470027.81.81524a.00.010101.0302.128001091001.01 Third domain ES: 470027.81.854b00.00.010101.0302.000000010051.01	AMHSLAND2 ES: 47.0027.81.815648.00.010101.0202.0202.8002.0100.01
CLNP	7.1	Traffic Type	1 (ATSC/No Traffic Type Policy Preference)	1 (ATSC/No Traffic Type Policy Preference)
	7.2	Security Class	1 (Unclassified)	1 (Unclassified)
	7.3	Priority	8	8
	7.4	Partial Route Recording	No	No

Table 22 Test Items and Schedule

Schedule (UTC)		Test Item No.		Description
Day	Time			
		1		Router Connection Establishment and Maintenance
		1	1 ~ 2	Data link establishment
		2	1 ~ 4	X.25 VC establishment
		3	1 ~ 2	IDRP connection establishment
		4	1 ~ 2	Exchange of routing information (UPDATE PDU transmission)
		5	1 ~ 2	Maintenance of IDRP connection (KEEPALIVE PDU transmission)
		2		NPDU Relay
		1	1 ~ 3	ERQ/ERP NPDU transmission /reply from AMHSLAND1 router to AMHSLAND2 router
		2	1 ~ 3	ERQ/ERP NPDU transmission /reply from AMHSLAND2 router to AMHSLAND1 router
		3	1 ~ 3	ERQ/ERP NPDU transmission/reply from AMHSLAND1 ES to valid destination in AMHSLAND2 domain
		4	1 ~ 3	ERQ/ERP NPDU transmission from AMHSLAND2 ES to valid destination in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
		5	1 ~ 2	ERQ NPDU transmission from AMHSLAND1 ES to unreachable ES in AMHSLAND2 domain
		6	1 ~ 2	ERQ NPDU transmission from AMHSLAND2 ES to unreachable ES in AMHSLAND1 domain (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
		7	1 ~ 2	Routing process in AMHSLAND1 router for NPDU with invalid security option parameter
		8	1 ~ 2	Routing process in AMHSLAND2 router for NPDU with invalid security option parameter (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)
		3		Router end-to-end tests
		1	1 ~ 5	Manual router disconnection at AMHSLAND1 router and route deletion
		2	1	Route activation from AMHSLAND1 router
		3	1 ~ 5	Manual router disconnection at AMHSLAND2 router and route deletion
		4	1	Route activation from AMHSLAND2 router
		5	1 ~ 3	Carrier medium failure and route deletion at AMHSLAND1 router
		6	1	Carrier medium restoration and route addition at AMHSLAND1 router

Schedule (UTC)		Test Item No.			Description
Day	Time				
			7	1 ~ 3	Carrier medium failure and route deletion at AMHSLAND2 router
			8	1	Carrier medium restoration and route addition at AMHSLAND2 router
			9	1 ~ 2	Failure and recovery of AMHSLAND1 router (redundant configuration)
			10	1 ~ 2	Failure and recovery of AMHSLAND2 router
		4			ATN Router Tests: Third Domain connected to AMHSLAND1
			1	1 ~ 5	Router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C connection already established)
			2	1 ~ 5	Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route
			3	1 ~ 4	Re-activation at ROUTER A of ROUTER A-ROUTER B route
			4	1 ~ 5	Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route
			5	1 ~ 4	Re-activation at ROUTER B of ROUTER A-ROUTER B route
			6	1 ~ 5	Router connection of ROUTER C to ROUTER A (ROUTER A-ROUTER B connection already established)
			7	1 ~ 5	Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route
			8	1 ~ 4	Re-activation at ROUTER C of ROUTER C-ROUTER A route
			9	1 ~ 5	Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route
			10	1 ~ 4	Re-activation at ROUTER A of ROUTER C-ROUTER A route
			11	1 ~ 3	Carrier medium failure of ROUTER A-ROUTER B circuit
			12	1 ~ 4	Carrier medium recovery of ROUTER A-ROUTER B circuit
			13	1 ~ 3	Carrier medium failure of ROUTER C-ROUTER A circuit
			14	1 ~ 4	Carrier medium recovery of ROUTER C-ROUTER A circuit
			15	1 ~ 2	Failure and recovery of ROUTER C
			16	1 ~ 2	Failure and recovery of ROUTER A
			17	1 ~ 2	Failure and recovery of ROUTER B
			18	1 ~ 6	End-to-End CLNP Echo Test between end systems in ROUTER C and ROUTER B domains (Subject to AMHSLAND2 ES ERQ NDU transmission capability.)

6 Test Cases

The table below shows the protocol abbreviations used in sequence diagrams.

Table 23 Protocol Abbreviations

Abbreviation	Protocol	Name
SABM	LAPB	Set Asynchronous Balanced Mode
UA	LAPB	Acknowledgement frame
SQ	X.25	Restart Request
SI	X.25	Restart Indication
SF	X.25	Restart Confirmation
CR	X.25	Call Request
CC	X.25	Call Connected
CQ	X.25	Clear Request
CF	X.25	Clear Confirmation
OPEN PDU	IDRP	OPEN Protocol Data Unit
UPDATE PDU	IDRP	UPDATE Protocol Data Unit
KEEPALIVE PDU	IDRP	KEEPALIVE Protocol Data Unit
CEASE PDU	IDRP	CEASE Protocol Data Unit
ERQ NPDU	CLNP	Echo request Network PDU
ERP NPDU	CLNP	Echo response Network PDU
ER NPDU	CLNP	Error report Network PDU

6.1 Test Case 1: Router Connection Establishment and Maintenance

a) Objective

This test is to verify the establishment of LAPB data link, X.25 Virtual Circuit and IDRPF connections between the AMHSLAND2 and AMHSLAND1 routers, the exchange of routing information by UPDATE PDUs, and the maintenance of the IDRPF connection by the periodic exchange of KEEPALIVE PDUs. The test configuration is shown in Figure 4.

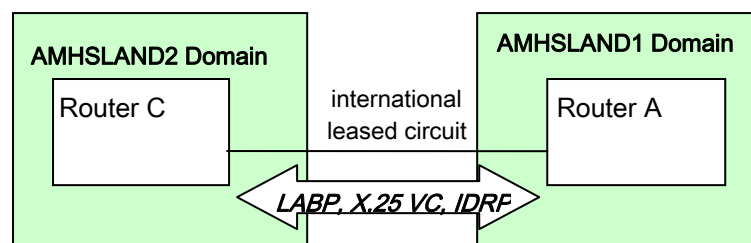


Figure 4 Configuration for router Connection & Maintenance Test

b) Test Items

- 1-1: Data link (LAPB) establishment
- 1-2: X.25 Virtual Circuit establishment
- 1-3: IDRPF connection establishment (exchange of OPEN PDUs)
- 1-4: Exchange of routing information (exchange of UPDATE PDUs)
- 1-5: Maintenance of IDRPF connection (exchange of KEEPALIVE PDUs)

Table 24 Router Connection Establishment & Maintenance Test Procedure

1. Router Connection Establishment & Maintenance		Test Item	Procedure	Result	Date/Time
Data link establishment	SABM transmission	1-1-1	Send SABM frame (address: 01) from ROUTER A and confirm ROUTER C receives it.	OK / NG	/ /
	UA transmission	1-1-2	Send UA frame (address: 03) from ROUTER C and confirm ROUTER A receives it and data link is established.	OK / NG	/ /
VC establishment	SQ transmission	1-2-1	Confirm ROUTER A sends SQ packet and ROUTER C receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	SI transmission	1-2-2	After receiving SQ packet from ROUTER A, confirm ROUTER C sends SI packet and ROUTER A receives it. (ROUTER C may send SQ packet, depending on the situation.)	OK / NG	/ /
	CR transmission	1-2-3	Confirm ROUTER A sends CR packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER C receives it.	OK / NG	/ /
	CC transmission	1-2-4	Confirm ROUTER C sends CC packet (packet size: 1024, LCGN: 0, LCN: 10, calling DTE address: ROUTER A DTE address, called DTE address: ROUTER C DTE address). Confirm ROUTER A receives it, and VC is established.	OK / NG	/ /
IDRP connection establishment	OPEN PDU transmission from ROUTER A	1-3-1	After VC establishment, confirm ROUTER A sends an OPEN PDU. Confirm ROUTER C receives it.	OK / NG	/ /
	OPEN PDU transmission from ROUTER C	1-3-2	After receiving OPEN PDU from ROUTER A, confirm ROUTER C sends an OPEN PDU. Confirm that ROUTER A receives it, and IDRP connection is established.	OK / NG	/ /

1. Router Connection Establishment & Maintenance		Test Item	Procedure	Result	Date/Time
UPDATE PDU transmission	UPDATE PDU transmission from ROUTER A	1-4-1	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and routing information for ROUTER A is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	1-4-2	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU (security registration ID: 06042B1B0000, tag set name: 07, ATSC Class: ATSC Class C, holding timer: 180 sec) to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and routing information for ROUTER C is added.	OK / NG	/ /
IDRP connection maintenance	KEEPALIVE PDU transmission from ROUTER A	1-5-1	After IDRP connection established, confirm ROUTER A sends a KEEPALIVE PDU to ROUTER C every 60 seconds. At ROUTER C, confirm routing information received from ROUTER A is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /
	KEEPALIVE PDU transmission from ROUTER C	1-5-2	After IDRP connection established, confirm ROUTER C sends a KEEPALIVE PDU to ROUTER A every 60 seconds. At ROUTER A, confirm routing information received from ROUTER C is not deleted by receiving KEEPALIVE PDU continuously.	OK / NG	/ /

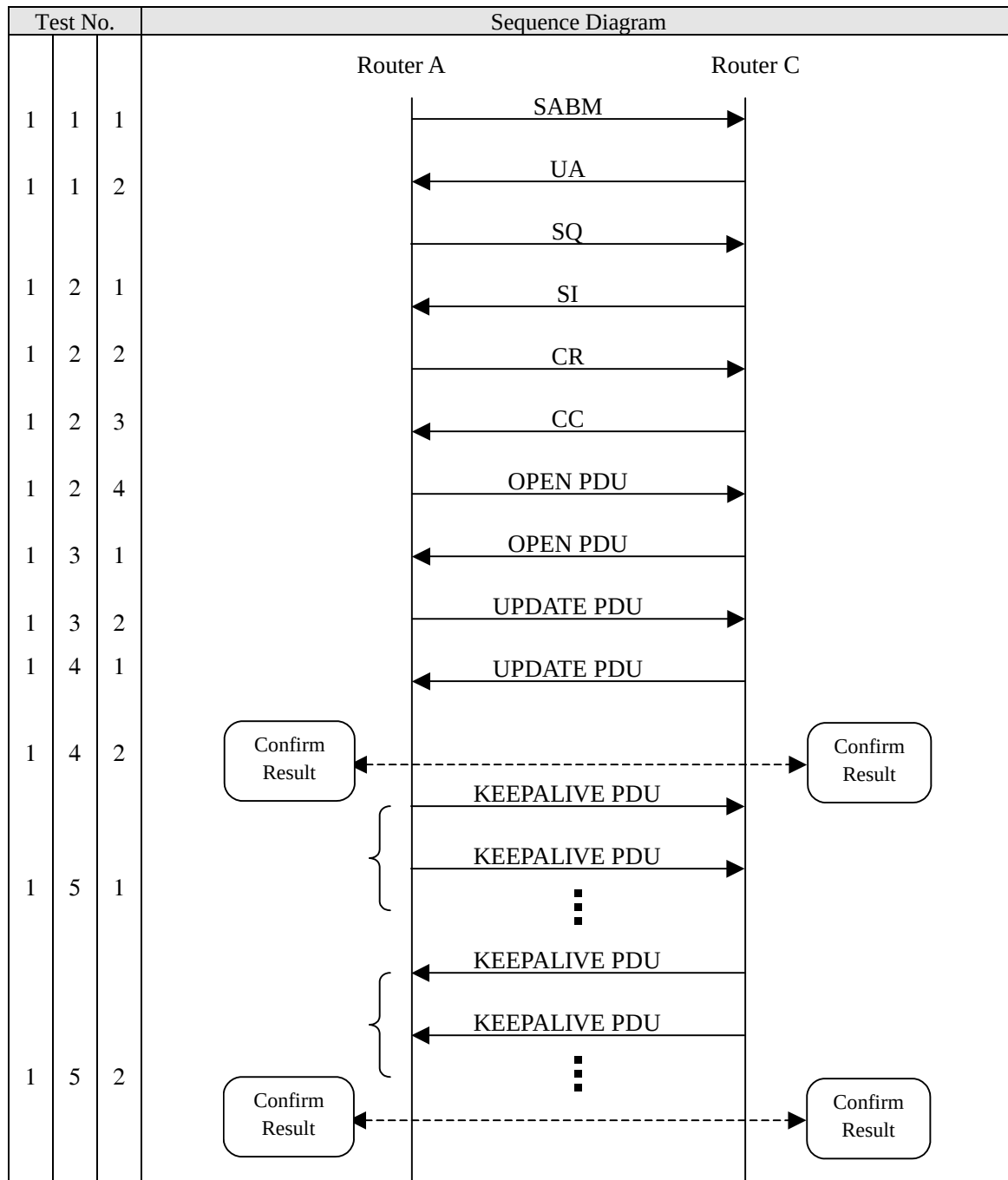


Figure 5 Sequence: Router Connection Establishment and Maintenance

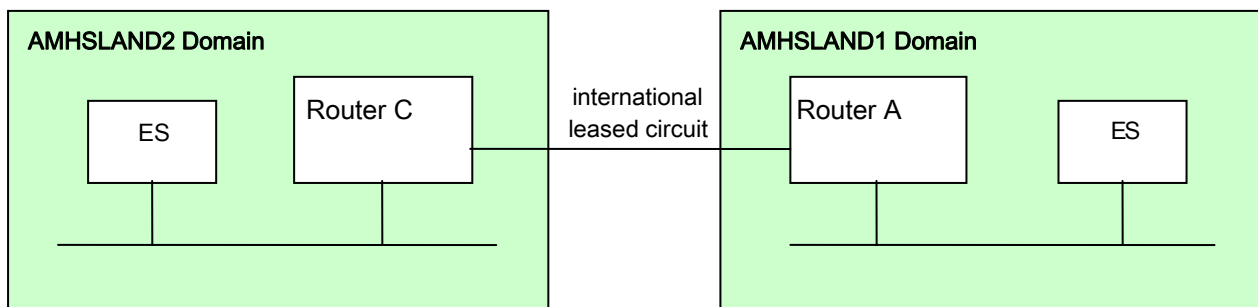
6.2 Test Case 2 : NPDU Relay

a) Overview

This test uses the CLNP Echo function to test correct relay and routing of CLNP NPDUs by the AMHSLAND2 and AMHSLAND1 routers. End Systems in both domains are used to verify end-to-end transmission of CLNP PDUs via the routers. The test configuration is shown in Figure 4. The test verifies the following:

- (i) CLNP Echo Request/Echo Response function of both routers.
- (ii) Relay of CLNP NPDUs by routers to the peer domain.
- (iii) ER-PDU returned by peer router when sending a CLNP NPDU to an unknown address in the peer domain.
- (iv) Non-relay of CLNP PDUs with incorrect security parameter by own domain router.

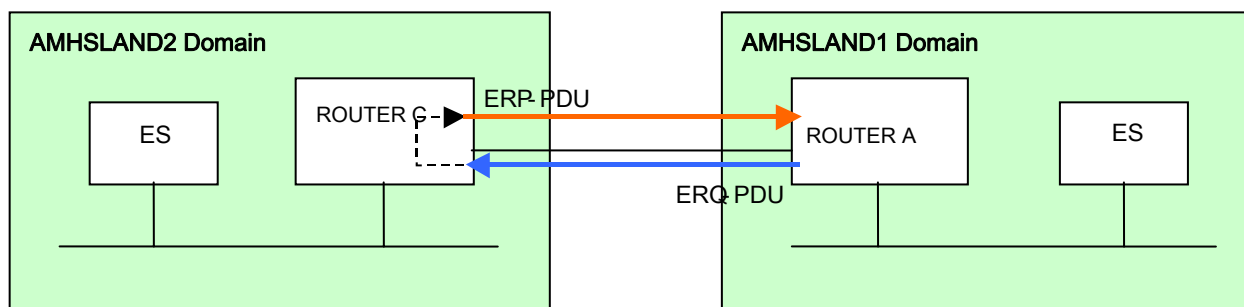
Figure 6 NPDU Transmission and Relay Test Configuration



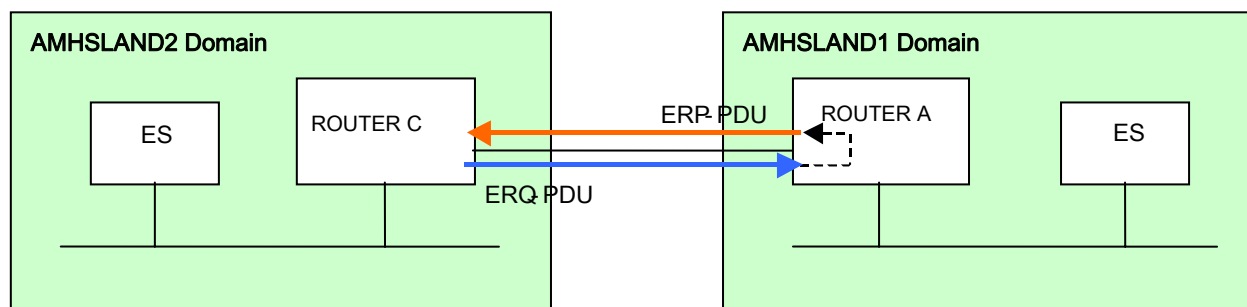
b) Test Items

Note: Some of these test items may not be carried out, depending on the capability of End Systems in each domain in to transmit ERQ-PDUs.

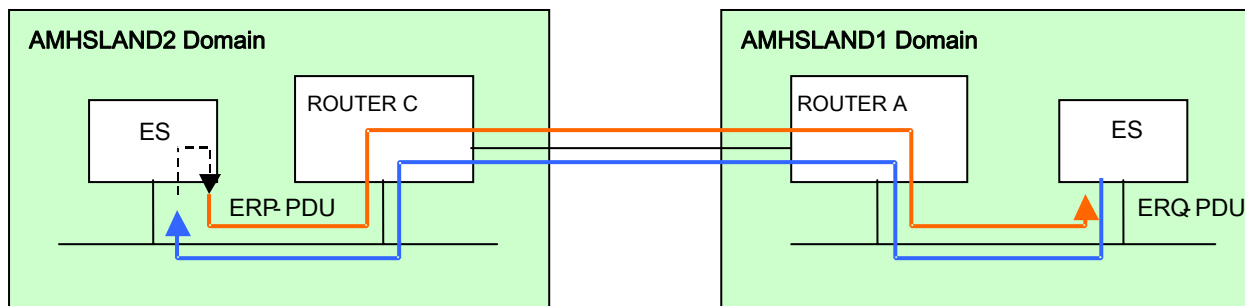
- 2-1: CLNP Echo from AMHSLAND1 router to AMHSLAND2 router.



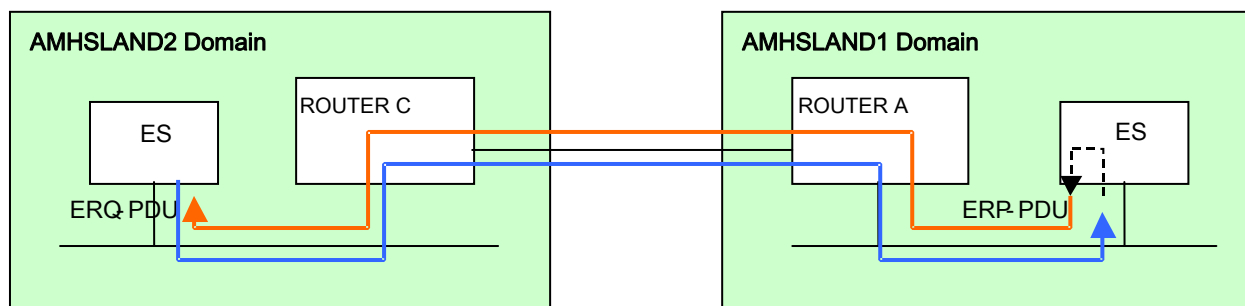
- 2-2: CLNP Echo from AMHSLAND2 router to AMHSLAND1 router.



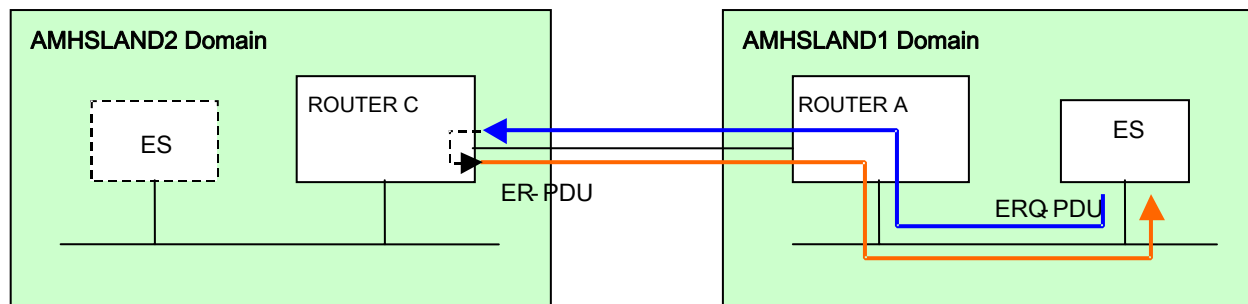
- 2-3: CLNP Echo from AMHSLAND1 End System to valid destination at AMHSLAND2.



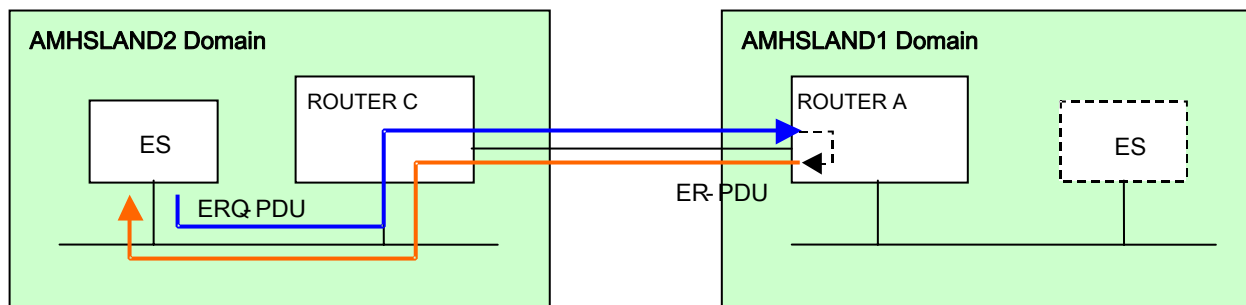
- 2-4: CLNP Echo from AMHSLAND2 End System to valid destination at AMHSLAND1.



- 2-5: CLNP Echo from AMHSLAND1 End System to unreachable AMHSLAND2 End System.

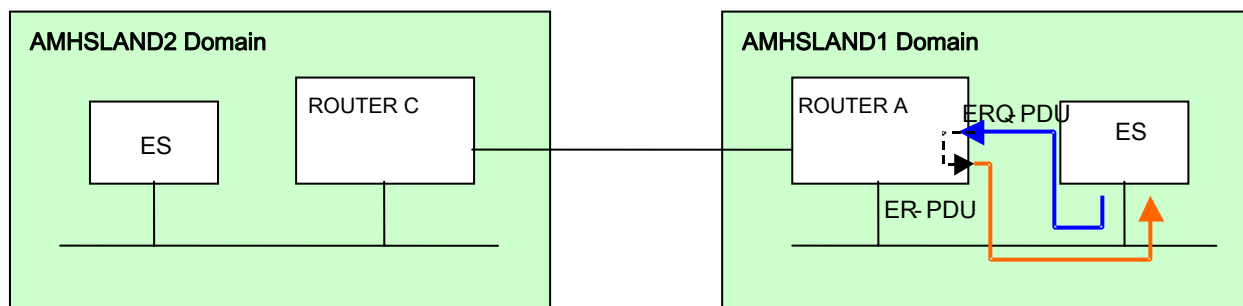


- 2-6: CLNP Echo from AMHSLAND2 End System to unreachable AMHSLAND1 End System.



- 2-7: Routing process in AMHSLAND1 router for NPDU with invalid security parameter.

Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.



- 2-8: Routing process in AMHSLAND2 router for NPDU with invalid security parameter.

Note: Transmission of ER NPDU depends on a value in the ERQ NPDU header.

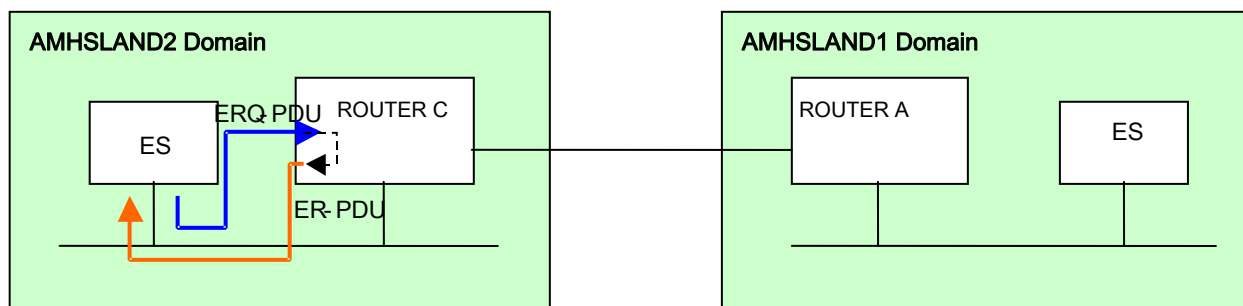


Table 25 NPDU Relay Test Procedure

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
ERQ NPDU transmission from AMHSLAND1 router	ERQ NPDU transmission	2-1-1	Send ERQ NPDU from ROUTER A to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	ERP NPDU transmission	2-1-2	After receiving ERQ NPDU, ROUTER C sends ERP NPDU to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-1-3	Repeat from 2-1-1 to 2-1-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 router	ERQ NPDU transmission	2-2-1	Send ERQ NPDU from ROUTER C to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	ERP NPDU transmission	2-2-2	After receiving ERQ NPDU, ROUTER A sends an ERP NPDU to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	Continuous ERQ/ERP NPDU transmission	2-2-3	Repeat from 2-2-1 to 2-2-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND1 ES	ERQ NPDU transmission	2-3-1	Send ERQ NPDU from AMHSLAND1 ES to AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-3-2	After receiving ERQ NPDU, the AMHSLAND2 ES sends an ERP NPDU to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-3-3	Repeat from 2-3-1 to 2-3-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 ES	ERQ NPDU transmission	2-4-1	Send ERQ NPDU from the AMHSLAND2 ES to the AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives it.	OK / NG	/ /
	ERP NPDU transmission	2-4-2	After receiving ERQ NPDU, the AMHSLAND1 ES sends an ERP NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives it.	OK / NG	/ /
	Continuous ERQ/ERP transmission	2-4-3	Repeat from 2-4-1 to 2-4-2 ten times and confirm there is no problem with ERQ/ERP transmission.	OK / NG	/ /

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
ERQ NPDU transmission from AMHSLAND1 ES to unreachable system in AMHSLAND2 domain	ERQ NPDU transmission from AMHSLAND1 ES	2-5-1	AMHSLAND1 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND2 domain. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND2 router	2-5-2	Confirm that ROUTER C discards the ERQ NPDU from AMHSLAND1 ES. Confirm that ROUTER C sends an ER NPDU to the AMHSLAND1 ES, and that the AMHSLAND1 ES receives it.	OK / NG	/ /
ERQ NPDU transmission from AMHSLAND2 ES to unreachable system in AMHSLAND1 domain	ERQ NPDU transmission from AMHSLAND2 ES	2-6-1	AMHSLAND2 ES sends an ERQ NPDU with destination NSAP address set to an unreachable address in AMHSLAND1 domain. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU handling in AMHSLAND1 router	2-6-2	Confirm that ROUTER A discards the ERQ NPDU. Confirm that ROUTER A sends an ER NPDU to the AMHSLAND2 ES, and that the AMHSLAND2 ES receives it.	OK / NG	/ /
Routing process in AMHSLAND1 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND1 ES	2-7-1	AMHSLAND1 ES sends an ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND2 ES. Confirm ROUTER A receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND1 router	2-7-2	Confirm ROUTER A discards ERQ NPDU and sends an ER NPDU to AMHSLAND1 ES. Confirm the AMHSLAND1 ES receives the ER NPDU.	OK / NG	/ /

2. NPDU Relay		Test Item	Procedure	Result	Date/Time
Routing process in AMHSLAND2 router for NPDU with invalid security option parameter	ERQ NPDU transmission from AMHSLAND2 ES	2-8-1	AMHSLAND2 ES sends ERQ NPDU with an invalid security option parameter (ATN Systems Management Communications/No Traffic Policy Preference) addressed to the AMHSLAND1 ES. Confirm ROUTER C receives it.	OK / NG	/ /
	ERQ NPDU processing in AMHSLAND2 router	2-8-2	Confirm ROUTER C discards ERQ NPDU and ROUTER C sends an ER NPDU to the AMHSLAND2 ES. Confirm the AMHSLAND2 ES receives the ER NPDU.	OK / NG	/ /

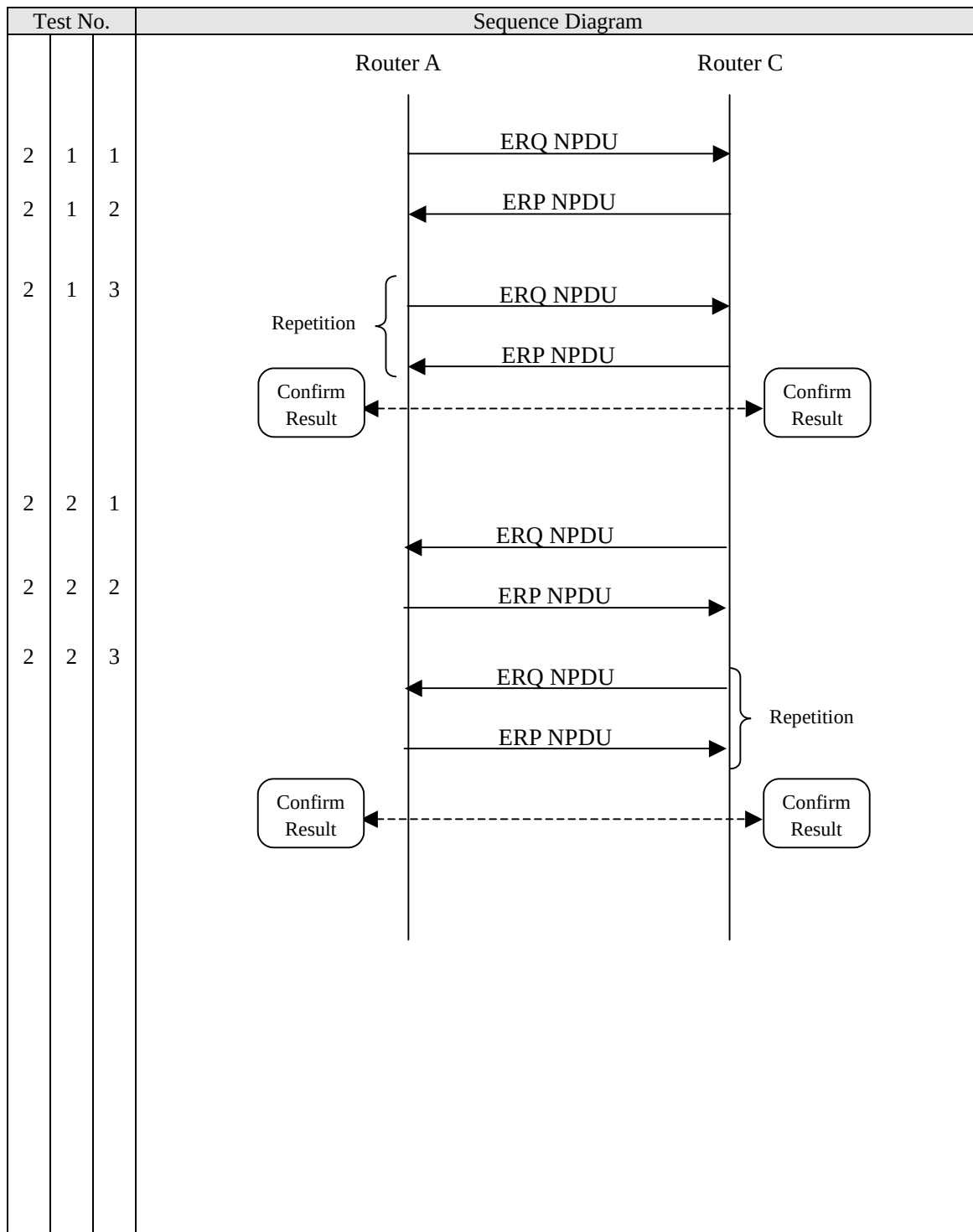


Figure 7 Sequence: NPDU Transmission between Routers

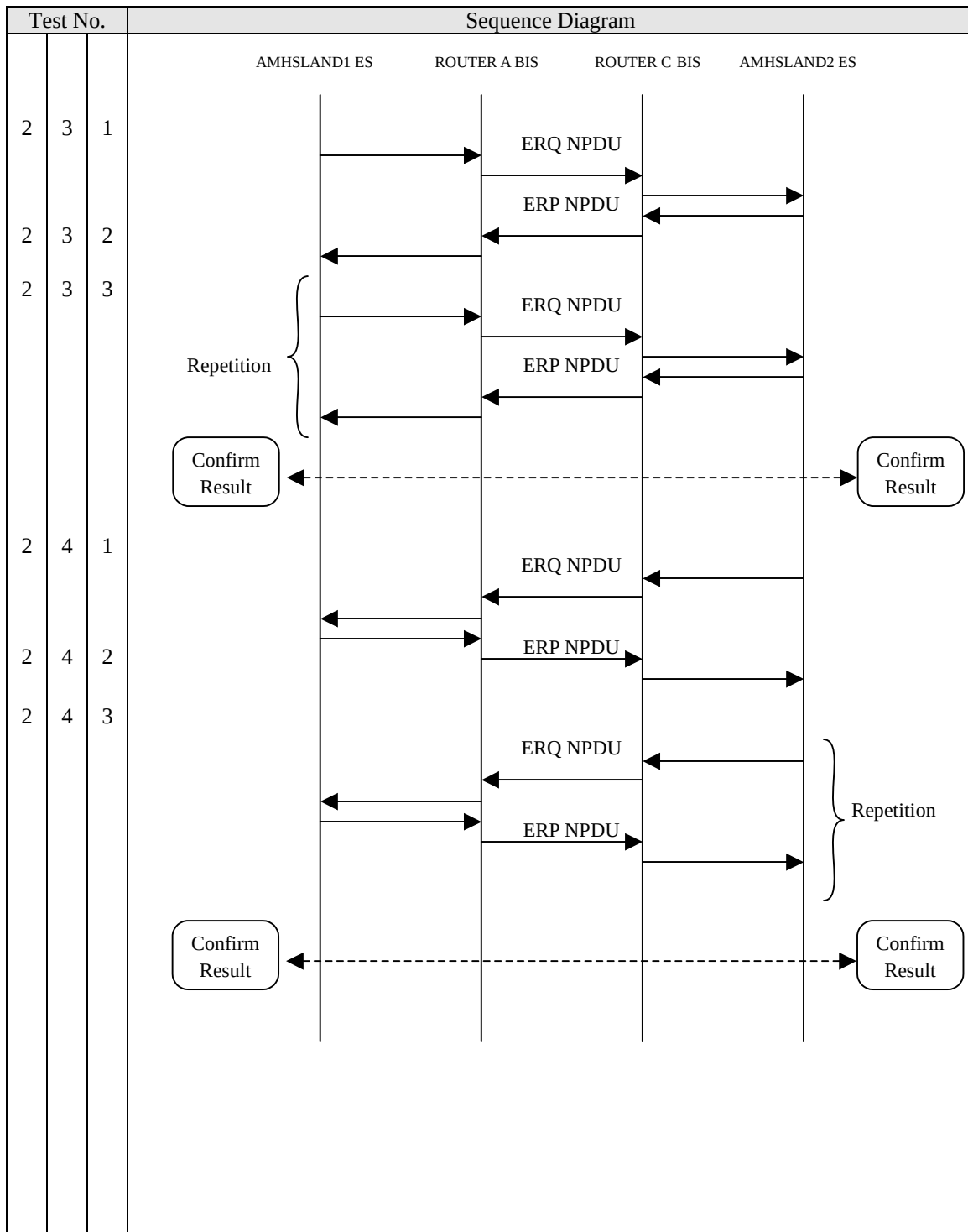


Figure 8 Sequence: NPDU Transmission between End Systems

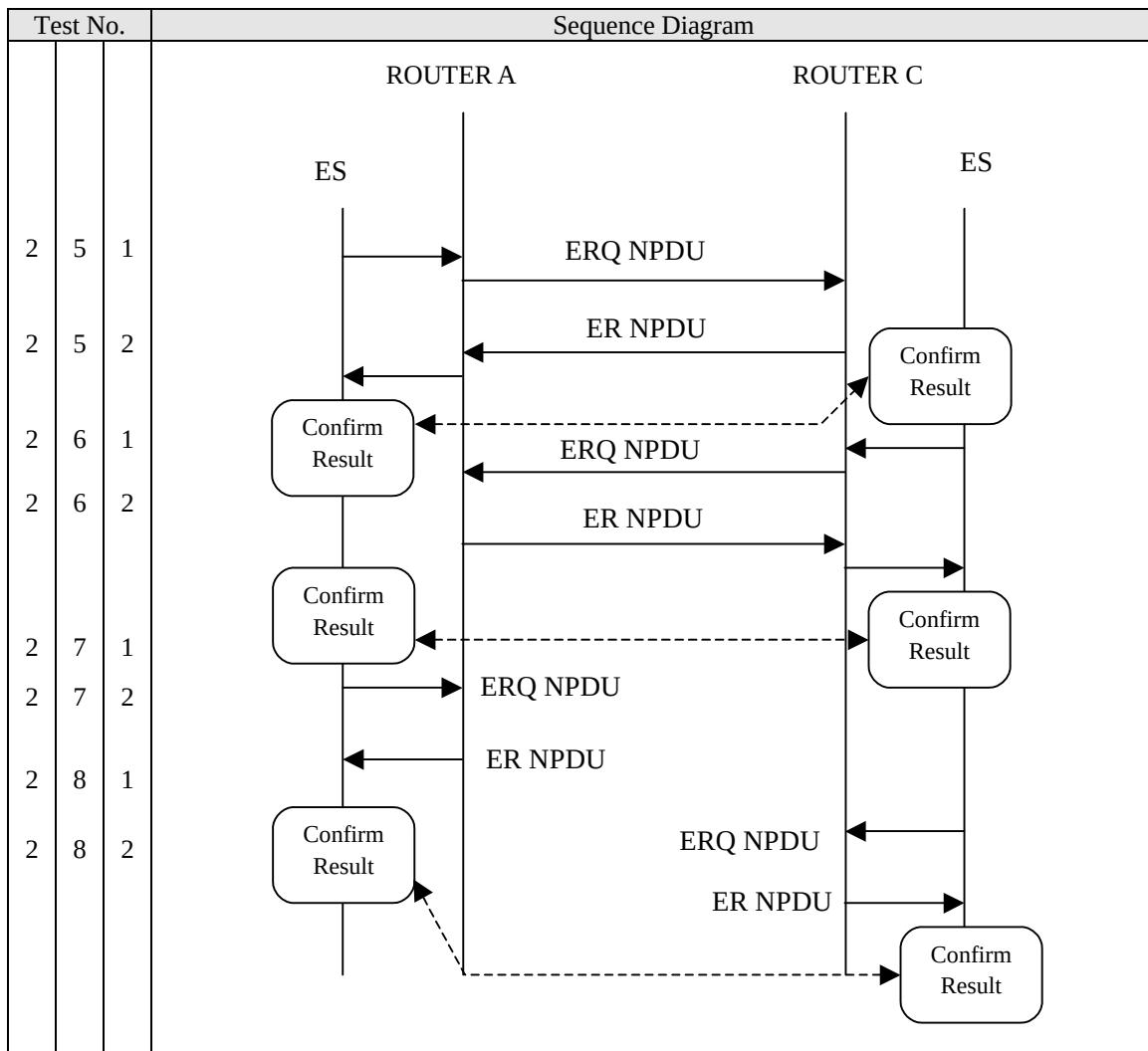


Figure 9 Sequence: NPDUs Transmission to Unreachable ES and Handling of NPDUs with Invalid Security Parameter

6.3 Test Case 3: Router End-to-End Tests

a) Objective

Technical trial to verify the automatic updating of routing tables in the ATN routers through IDRP protocol with routers connecting in end-to-end configuration between AMHSLAND1 and AMHSLAND2.

b) Test Configuration

The configuration for this test is shown in Figure 8.

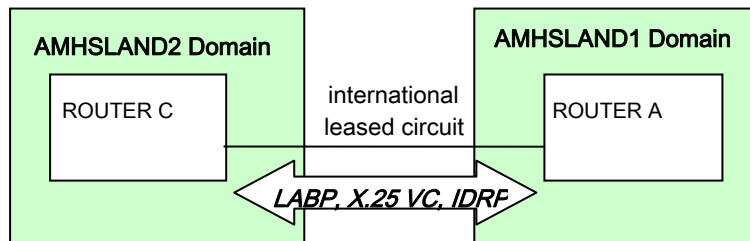


Figure 10 Router End-to-End Test Configuration

c) Test Item Overview

- 3-1: Manual router disconnection at AMHSLAND1 router and route deletion
- 3-2: Route addition (re-activation of connection) from AMHSLAND1 router
- 3-3: Manual router disconnection at AMHSLAND2 router and route deletion
- 3-4: Route addition (re-activation of connection) from AMHSLAND2 router
- 3-5: Carrier medium failure and route deletion at AMHSLAND1 router
- 3-6: Carrier medium restoration and route addition at AMHSLAND1 router
- 3-7: Carrier medium failure and route deletion at AMHSLAND2 router
- 3-8: Carrier medium restoration and route addition at AMHSLAND2 router
- 3-9: Failure and recovery of AMHSLAND1 router (redundant configuration)
- 3-10: Failure and recovery of AMHSLAND2 router

Note:

A detailed test of normal router connection (LAPB, X.25 VC and IDRP) is carried out in Test Items 1-1 through 1-5, and so is not repeated here.

Table 26 Router End-to-End Tests Test Procedure

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Manual router disconnection at AMHSLAND1 router and route deletion	CEASE PDU transmission from AMHSLAND1 router	3-1-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND2 router and route deletion	3-1-2	Confirm ROUTER C receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER C sends CEASE PDU to ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND1 router	3-1-3	Confirm that ROUTER A receives CEASE PDU from ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	CQ transmission	3-1-4	After IDRP disconnected, confirm ROUTER A sends CQ packet to ROUTER C. Confirm ROUTER C receives it.	OK / NG	/ /
	CF transmission	3-1-5	After receiving CQ packet, confirm ROUTER C sends CF packet to ROUTER A. Confirm ROUTER A receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND1 router	Router connection restoration after disconnection	3-2-1	At ROUTER A, manually initiate router connection with ROUTER C. (VC call: originate, OPEN PDU: send.) Confirm the router connection is re-established.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Manual router disconnection at AMHSLAND2 router and route deletion	CEASE PDU transmission from AMHSLAND2 router	3-3-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends CEASE PDU.	OK / NG	/ /
	CEASE PDU transmission from AMHSLAND1 router and route deletion	3-3-2	Confirm ROUTER A receives CEASE PDU. After receiving CEASE PDU, confirm that ROUTER A sends CEASE PDU to ROUTER C, and that routing information for ROUTER C is deleted.	OK / NG	/ /
	Route deletion at AMHSLAND2 router	3-3-3	Confirm that ROUTER C receives CEASE PDU from ROUTER A, and that routing information for ROUTER A is deleted.	OK / NG	/ /
	CQ transmission	3-3-4	After IDRП disconnected, confirm ROUTER C sends CQ packet to ROUTER A. Confirm ROUTER A receives it.	OK / NG	/ /
	CF transmission	3-3-5	After receiving CQ packet, confirm ROUTER A sends CF packet to ROUTER C. Confirm ROUTER C receives CF packet, and VC is closed.	OK / NG	/ /
Route addition (re-activation of connection) from AMHSLAND2 router	Router connection restoration after disconnection	3-4-1	At ROUTER C, manually initiate router connection to ROUTER A. (VC call: receive, OPEN PDU: receive.) Confirm the router connection is re-established.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND1 router	Data link and VC disconnection	3-5-1	At ROUTER A, simulate a circuit failure by physically disconnecting ROUTER A from the DSU/modem. Confirm that the data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-5-2	After circuit failure, confirm IDRП connection at ROUTER A is closed.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-5-3	After circuit failure, confirm IDRП connection at ROUTER C is closed when the IDRП holding timer expires.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Carrier medium restoration and route addition at AMHSLAND1 router	Data link, VC, and router connection re-establishment	3-6-1	At ROUTER A, restore the circuit by re-connecting ROUTER A to the DSU/modem. Confirm router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Carrier medium failure and route deletion at AMHSLAND2 router	Data link and VC disconnection	3-7-1	At ROUTER C, simulate a circuit failure by disconnecting the leased line circuit from the modem. Confirm data link and VC are disconnected between ROUTER A and ROUTER C.	OK / NG	/ /
	IDRP disconnection at AMHSLAND2	3-7-2	After circuit failure, confirm IDRP connection at ROUTER C is closed when the IDRP holding timer expires.	OK / NG	/ /
	IDRP disconnection at AMHSLAND1	3-7-3	After circuit failure, confirm IDRP connection at ROUTER A is closed.	OK / NG	/ /
Carrier medium restoration and route addition at AMHSLAND2 router	Data link, VC, and router connection re-establishment	3-8-1	At ROUTER C, restore circuit. Confirm the router connection is re-established between ROUTER A and ROUTER C.	OK / NG	/ /
Failure and recovery of AMHSLAND1 router	Failover from active to standby node	3-9-1	At ROUTER A, force failover from active node (#1) to standby node (#2) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-9-2	At ROUTER A, force failover from active node (#2) to standby node (#1) by rebooting active node. At ROUTER A, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

3. Router End-to-End Tests		Test Item	Procedure	Result	Date/Time
Failure and recovery of AMHSLAND2 router	Failover from active to standby node	3-10-1	At ROUTER C, force failover from active node (#1) to standby node (#2). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /
	Failover back to previous active node	3-10-2	At ROUTER C, force failover from active node (#2) to standby node (#1). At ROUTER C, confirm WAN line switches from active to standby node. Confirm that router connection is closed and then re-established.	OK / NG	/ /

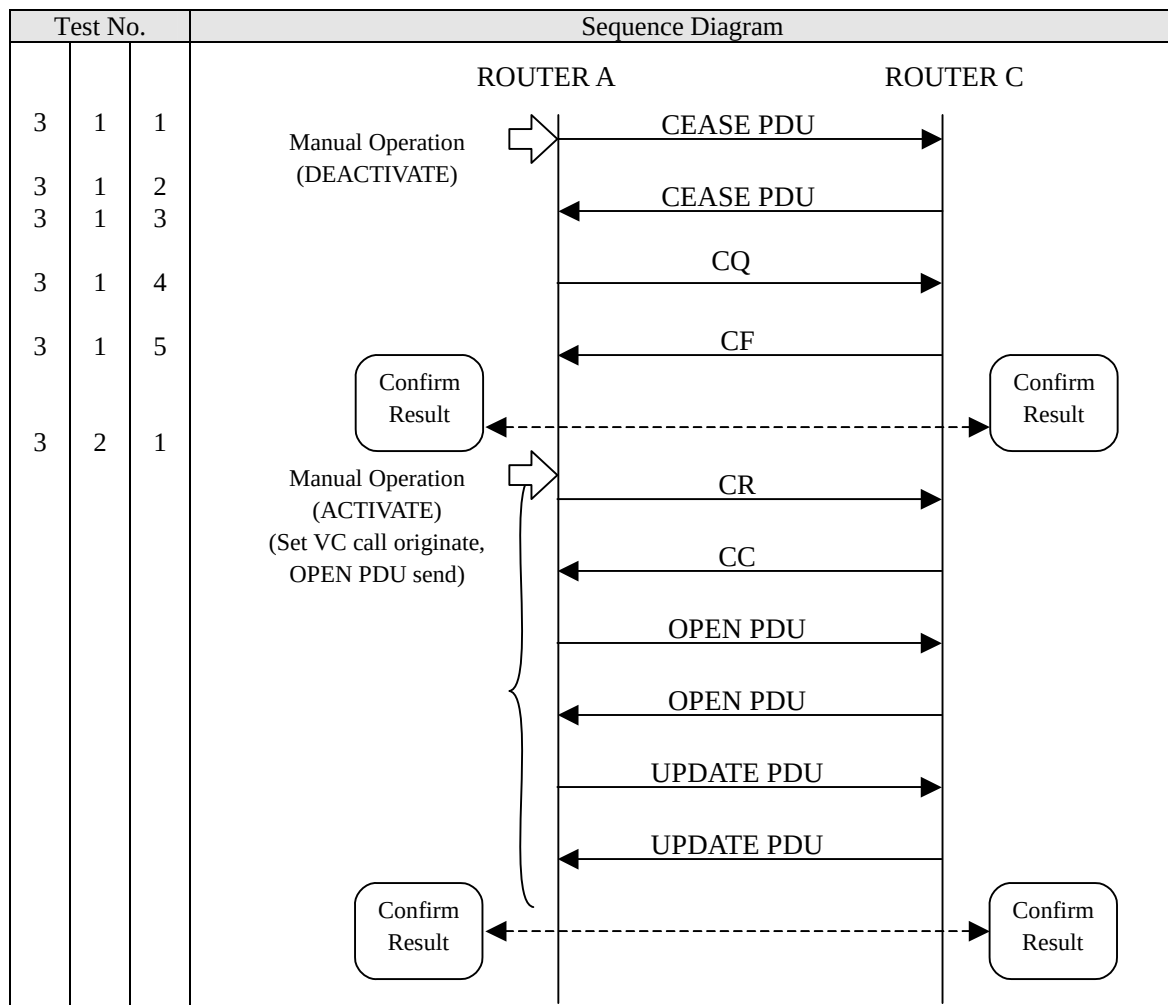


Figure 11 Sequence: Manual router Disconnection and Re-connection at AMHSLAND1 router

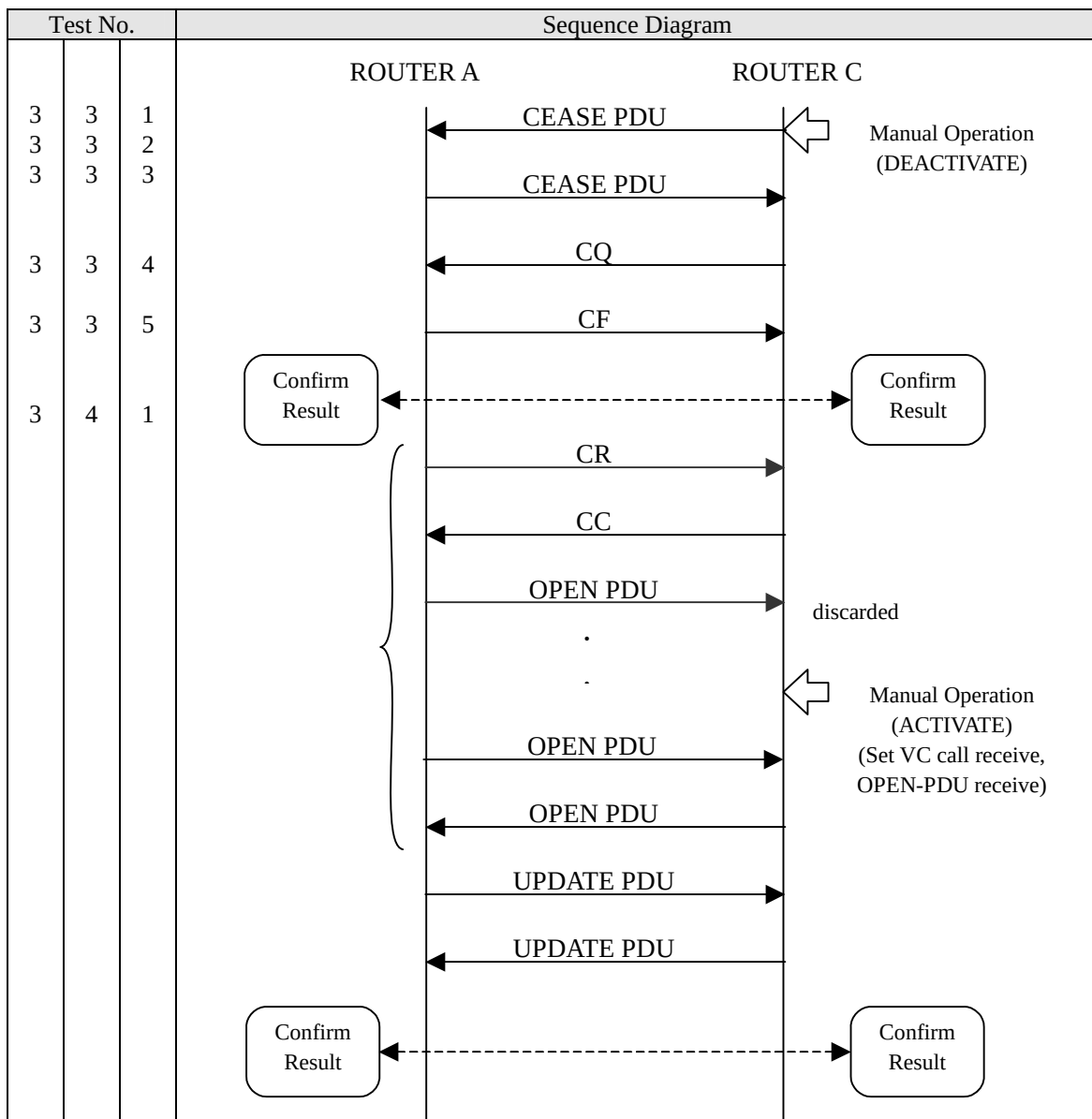


Figure 12 Sequence: Manual router Disconnection and Re-connection at AMHSLAND2 router

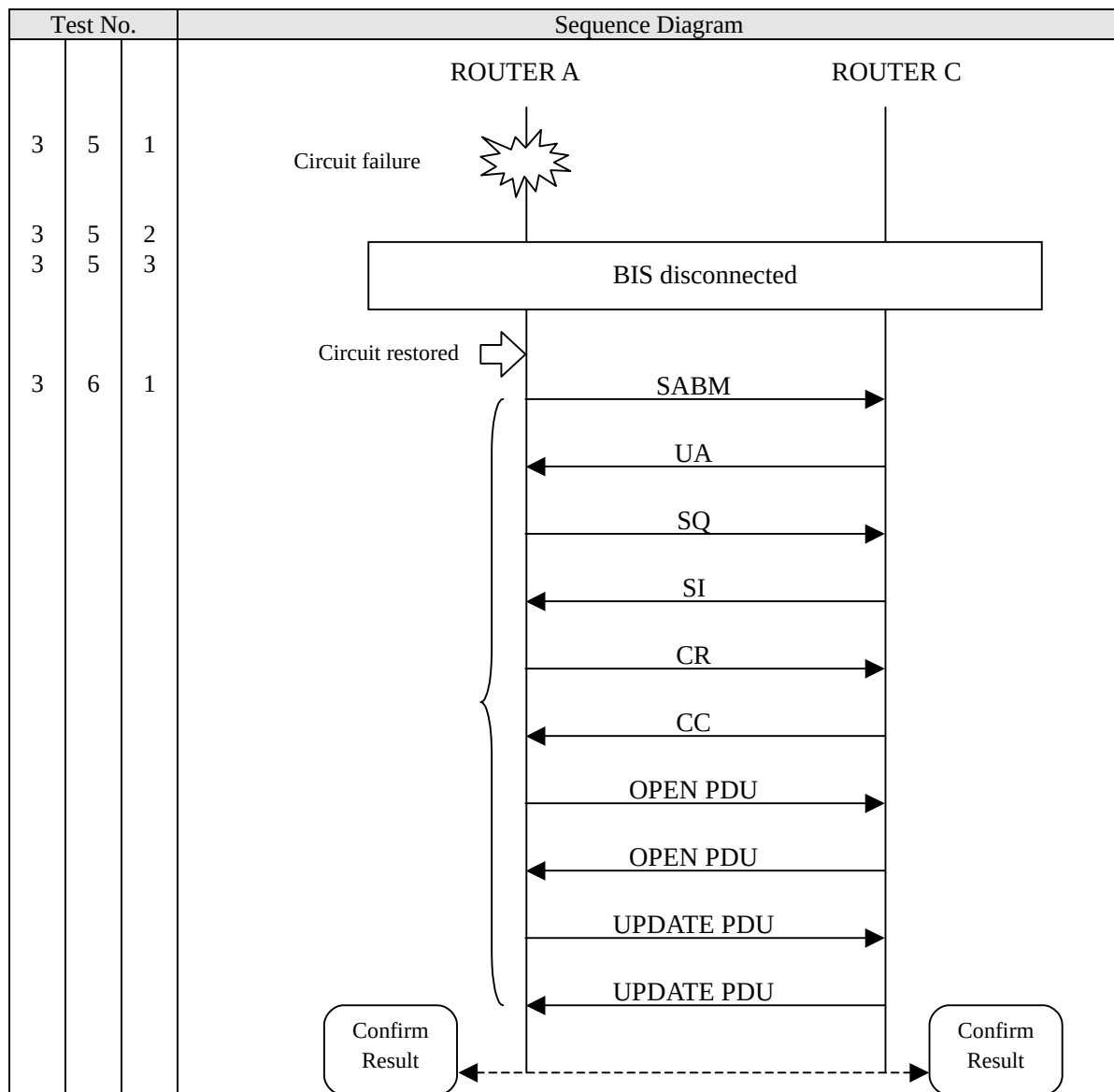


Figure 13 Sequence: Carrier medium failure and recovery at AMHSLAND1 router

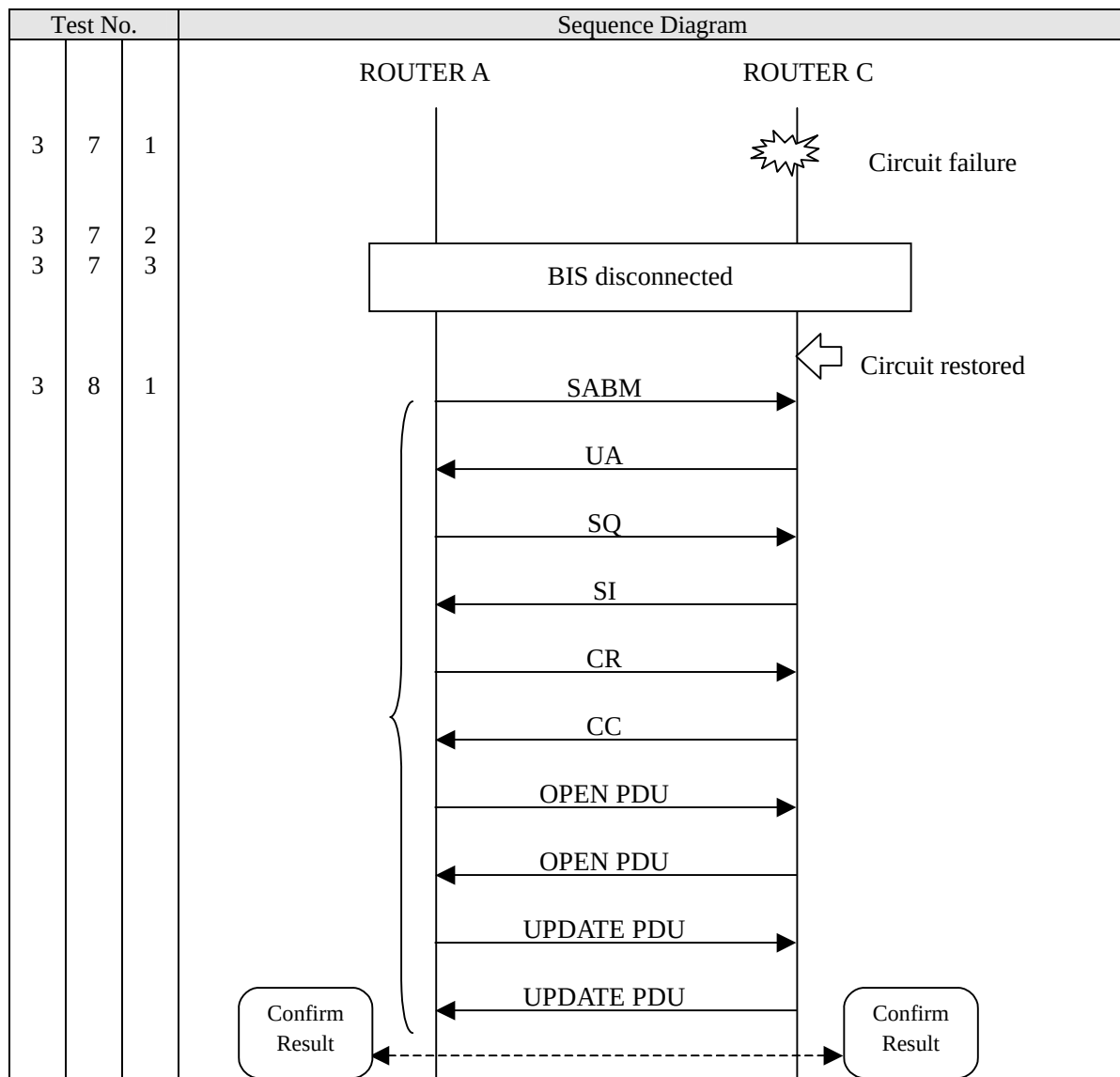


Figure 14 Sequence: Carrier medium failure and recovery at AMHSLAND2 router

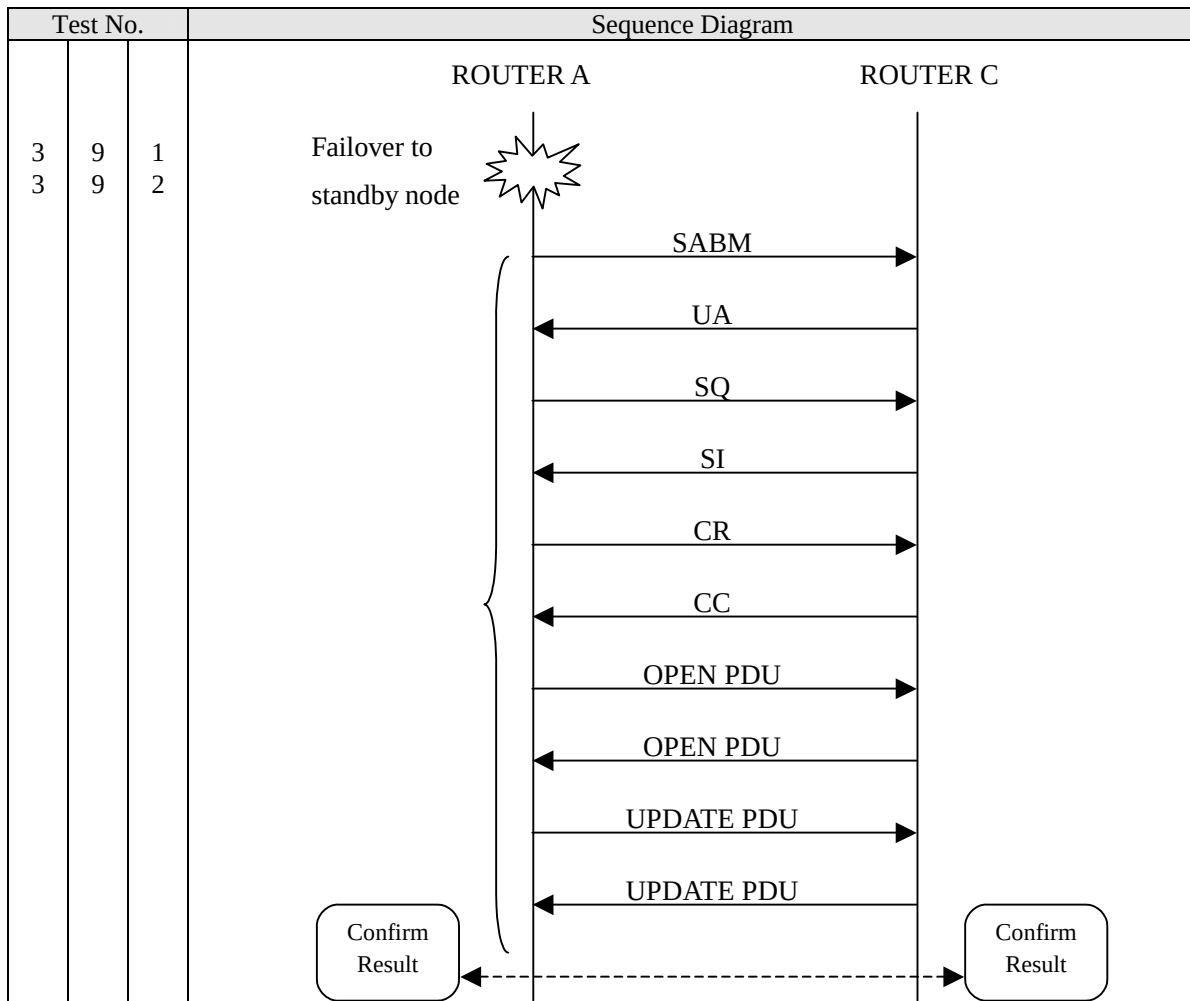


Figure 15 Sequence: AMHSLAND1 router Failure and Recovery

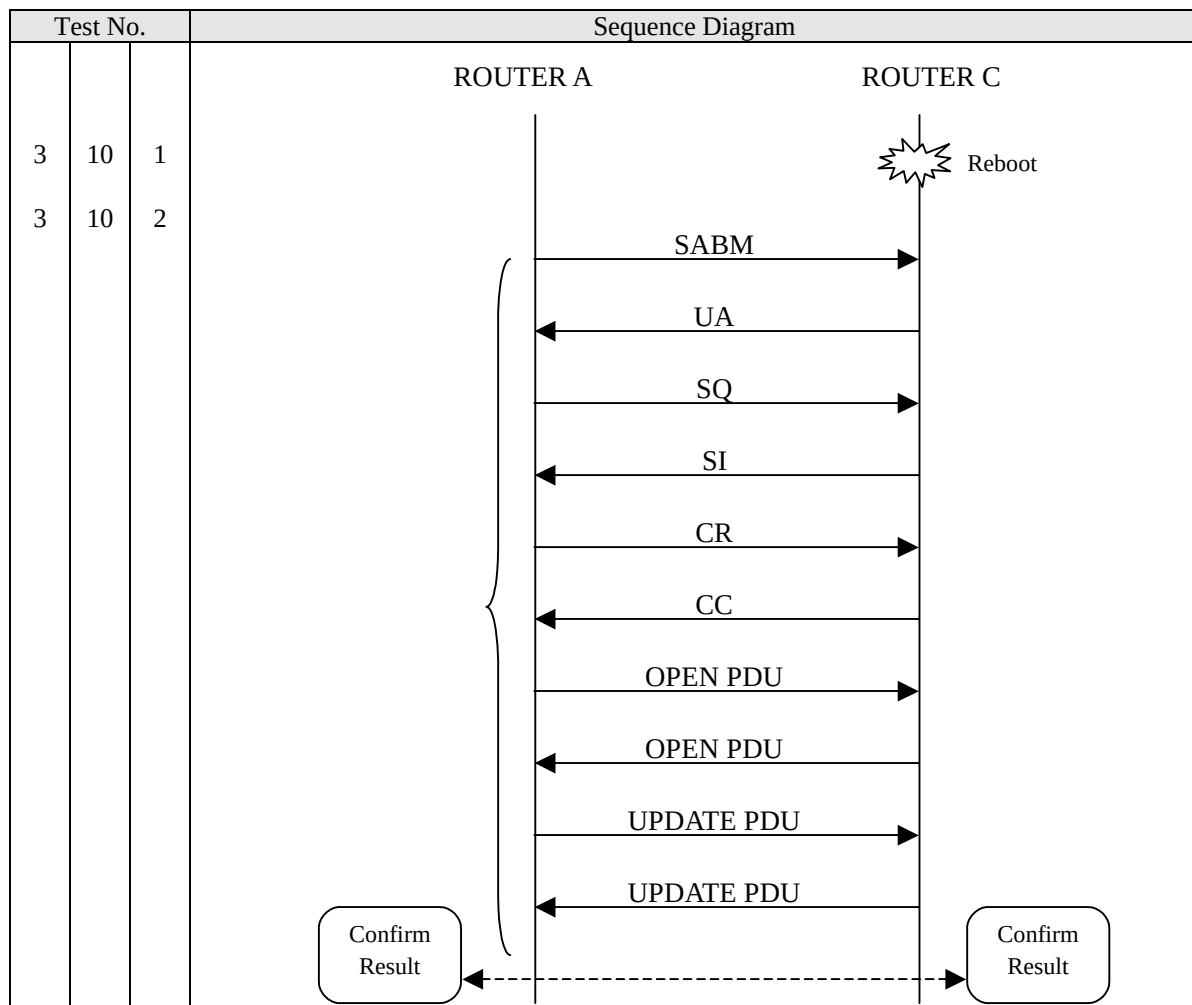


Figure 16 Sequence: AMHSLAND2 router Failure and Recovery

6.4 Test Case 4: ATN Router Tests (This cover additional tests for subnetwork)

a) Objective

Technical trial to verify the automatic updating of routing tables in ATN routers through the IDRP protocol with routers connected in 3routers configurations between AMHSLAND1, AMHSLAND2 and simulated third domains connected to AMHSLAND1 and AMHSLAND2. The test configurations are shown below.

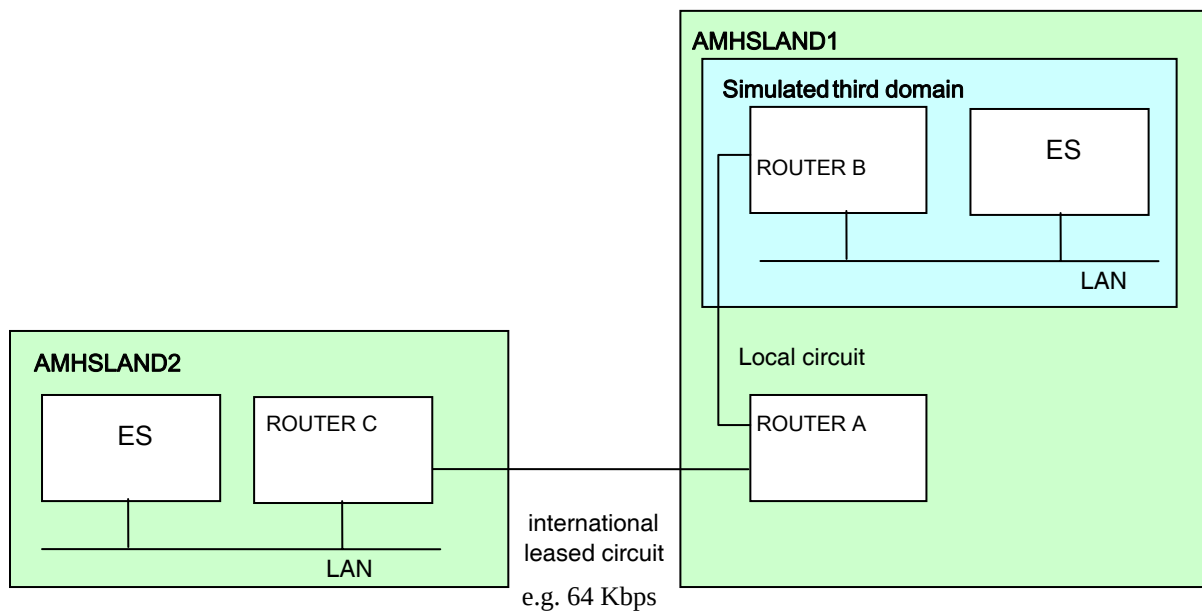


Figure 17 Test Configuration: Simulated Third Domain connected to AMHSLAND1

b) Test Overview**(i) Simulated third domain connected to AMHSLAND1.*****ROUTER CONNECTION, DISCONNECTION AND RE-ACTIVATION***

- 4-1: Router connection of ROUTER B to ROUTER A (ROUTER A-ROUTER C already established).
- 4-2, 4-3: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.
- 4-4, 4-5: Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.
- 4-6: Router connection of ROUTER C to ROUTER A (ROUTER B-ROUTER A already established).
- 4-7, 4-8: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation.
- 4-9, 4-10: Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation.

COMMUNICATION CIRCUIT FAILURE AND RECOVERY

- 4-11, 4-12: Failure and recovery of ROUTER A-ROUTER B circuit.
- 4-13, 4-14: Failure and recovery of ROUTER C-ROUTER A circuit.

ROUTER FAILURE AND RECOVERY

- 4-15: Failure and recovery of ROUTER C.
- 4-16: Failure and recovery of ROUTER A.
- 4-17: Failure and recovery of ROUTER B.

END-TO-END DATA RELAY

- 4-18: End-to-End CLNP Echo Test between End Systems in ROUTER C and ROUTER B domains.
(Subject to End System ERQ-PDU transmission capabilities.)

Table 27 Router Connection, Disconnection and Re-activation Test Procedure: Router A – Router B

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Router connection of ROUTER B to ROUTER A	Data link establishment between ROUTER A and ROUTER B	4-1-1	With VC and IDRP connections established between ROUTER C and ROUTER A, switch on ROUTER B to initiate router connection. Check and confirm data link and VC are established between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP connection establishment between ROUTER A and ROUTER B	4-1-2	After VC establishment, check and confirm IDRP connection established between ROUTER A and ROUTER B by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-1-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-1-4	After IDRP connection established, confirm ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check and confirm route information of ROUTER B is updated correctly.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-1-5	At ROUTER A, after receiving UPDATE PDU from ROUTER B, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received, and that route information of ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER A	4-2-1	At ROUTER A, manually close the router connection to ROUTER B. Confirm ROUTER A sends a CEASE PDU to ROUTER B.	OK / NG	/ /
	CEASE PDU transmission from ROUTER B and route deletion	4-2-2	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-2-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	VC disconnection between ROUTER A and ROUTER B	4-2-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-2-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-3-1	At ROUTER A, manually initiate router connection to ROUTER B (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-3-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-3-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, check that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-3-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that route information to ROUTER B is added.	OK / NG	/ /
Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route	CEASE PDU transmission from ROUTER B	4-4-1	At ROUTER B, manually close the router connection to ROUTER A. Confirm ROUTER B sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-4-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER B. Confirm ROUTER A sends CEASE PDU to ROUTER B, and that route information for ROUTER B is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER B	4-4-3	At ROUTER B, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER C are deleted.	OK / NG	/ /
	VC disconnection between ROUTER A and ROUTER B	4-4-4	Confirm that the VC between ROUTER A and ROUTER B is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C, and route deletion	4-4-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Route re-activation from ROUTER B	Router connection re-activation from ROUTER B	4-5-1	At ROUTER B, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-5-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B to ROUTER A	4-5-3	Confirm that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C and route addition	4-5-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER B is added.	OK / NG	/ /

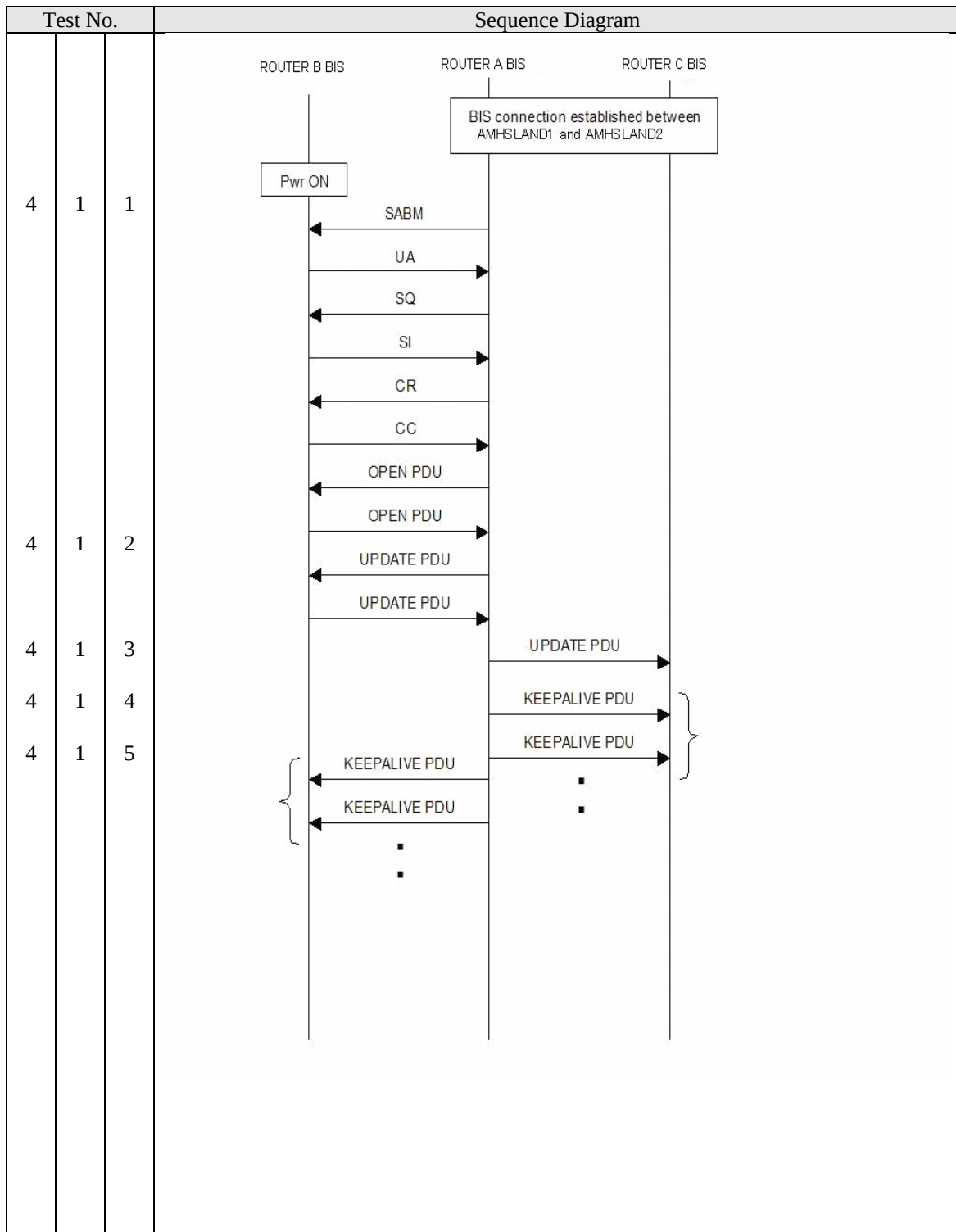


**Figure 18 Sequence: router connection of ROUTER B to ROUTER A
(ROUTER A-ROUTER C already established)**

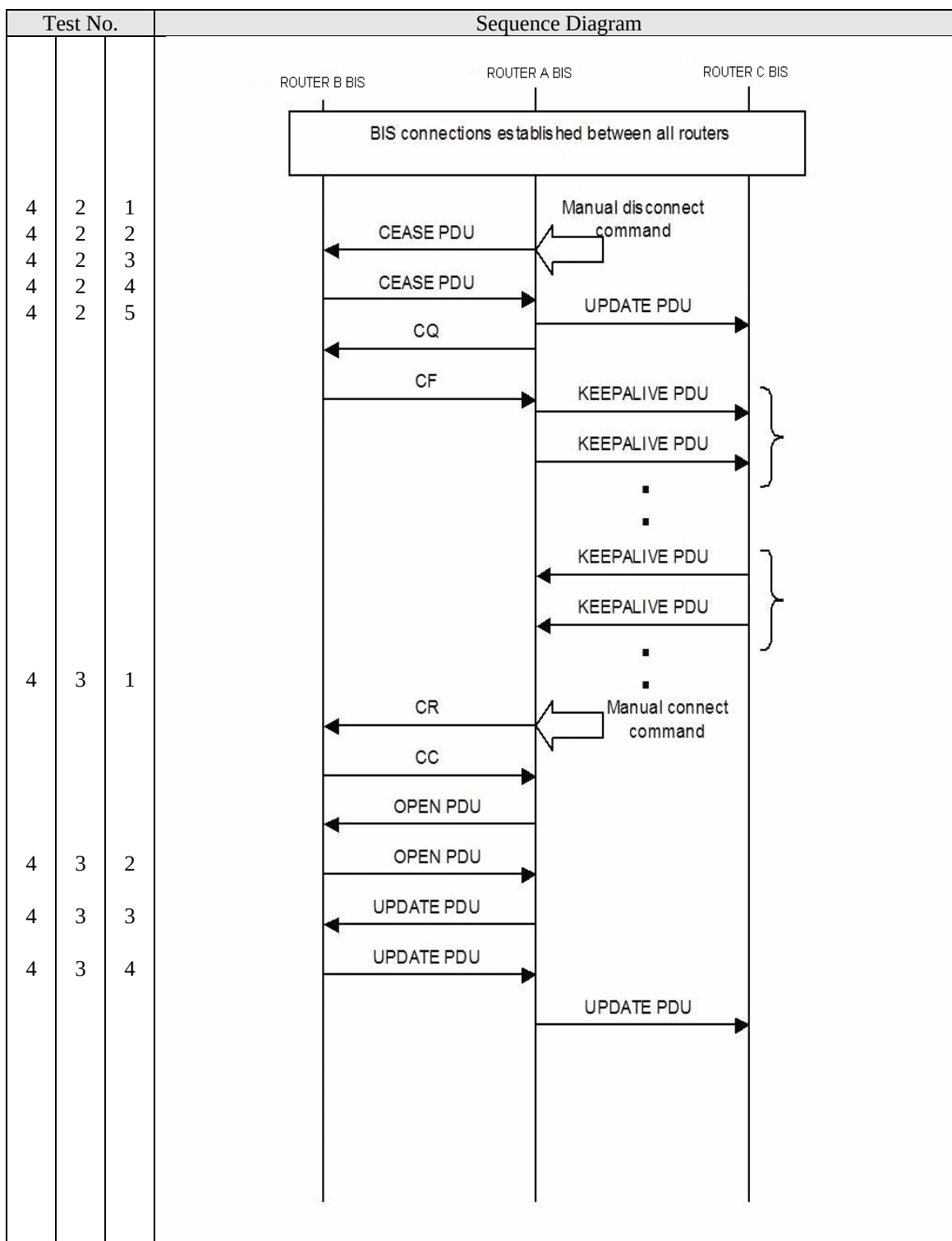


Figure 19 Sequence: Manual router disconnection at ROUTER A of ROUTER A-ROUTER B route and re-activation.

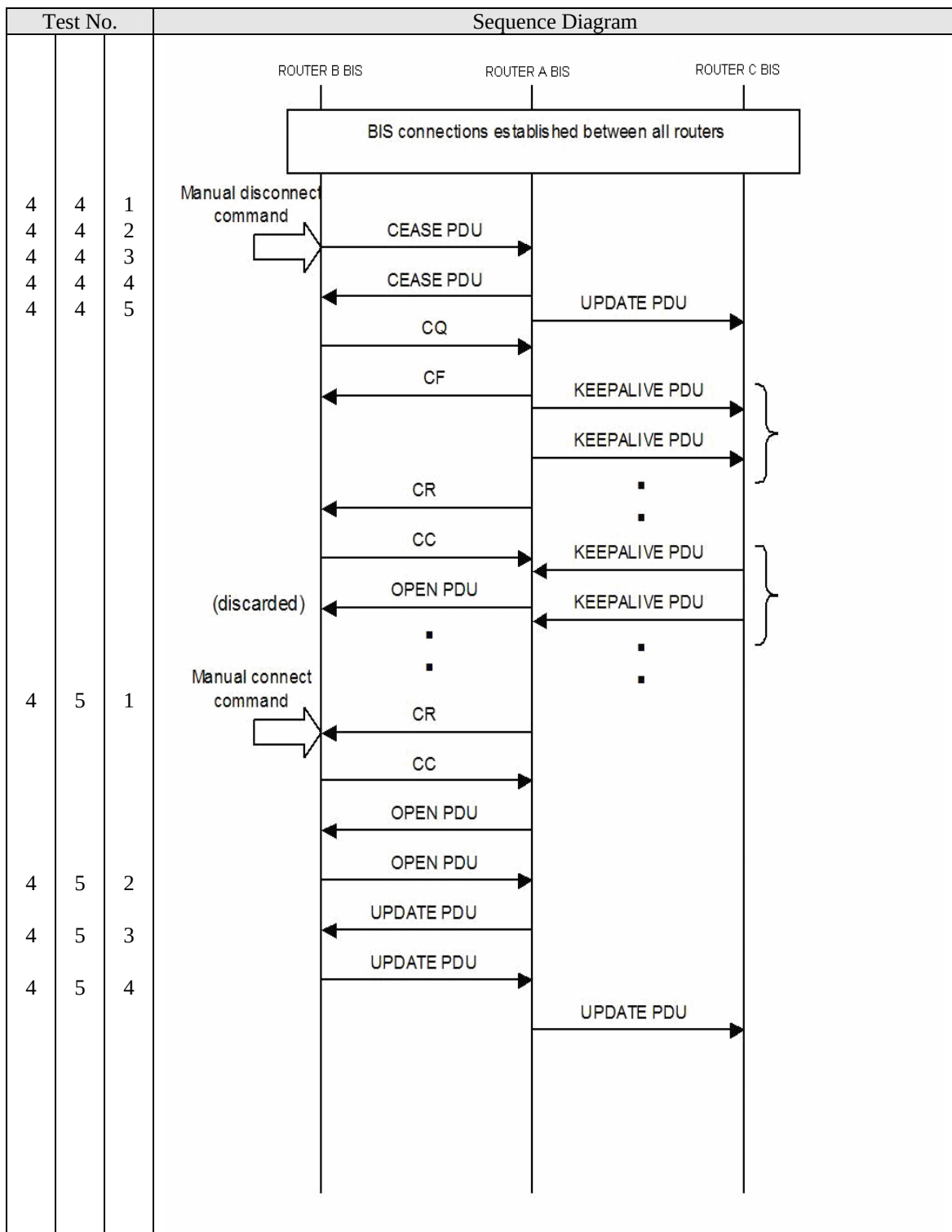


Figure 20 Sequence: Manual router disconnection at ROUTER B of ROUTER A-ROUTER B route and re-activation.

Table 28 Router Connection, Disconnection and Re-activation Test Procedure: ROUTER C-ROUTER A

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Router connection of ROUTER C to ROUTER A	Data link establishment between ROUTER C and ROUTER A	4-6-1	With VC and IDRP connections established between ROUTER A and ROUTER B, at ROUTER A, initiate router connection to ROUTER C. Check and confirm data link and VC are established between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP connection establishment between ROUTER C and ROUTER A	4-6-2	After VC establishment, check and confirm IDRP connection established between ROUTER C and ROUTER A by exchange of OPEN PDUs. (First OPEN PDU sent by ROUTER A.)	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-6-3	After IDRP connection established, confirm ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, after receiving UPDATE PDU from ROUTER A, check that route information on ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-6-4	After IDRP connection established, confirm ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm route information of ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B	4-6-5	At ROUTER A, after receiving UPDATE PDU from ROUTER C, confirm ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, after receiving UPDATE PDU from ROUTER A, confirm that route information of ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER C	4-7-1	At ROUTER C, manually close the router connection to ROUTER A. Confirm ROUTER C sends a CEASE PDU to ROUTER A.	OK / NG	/ /
	CEASE PDU transmission from ROUTER A and route deletion	4-7-2	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C. Confirm ROUTER A sends CEASE PDU to ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Route deletion at ROUTER C	4-7-3	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-7-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-7-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER C	Router connection re-activation from ROUTER C	4-8-1	At ROUTER C, manually initiate router connection to ROUTER A (VC call: called, OPEN PDU: receive). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-8-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-8-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-8-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm that UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route	CEASE PDU transmission from ROUTER A	4-9-1	At ROUTER A, manually close the router connection to ROUTER C. Confirm ROUTER A sends a CEASE PDU to ROUTER C.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	CEASE PDU transmission from ROUTER C and route deletion	4-9-2	At ROUTER C, confirm receipt of CEASE PDU from ROUTER A, and that route information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /
	Route deletion at ROUTER A	4-9-3	At ROUTER A, confirm receipt of CEASE PDU from ROUTER C, and that route information for ROUTER C is deleted.	OK / NG	/ /
	VC disconnection between ROUTER C and ROUTER A	4-9-4	Confirm that the VC between ROUTER C and ROUTER A is closed normally.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B, and route deletion	4-9-5	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Route re-activation from ROUTER A	Router connection re-activation from ROUTER A	4-10-1	At ROUTER A, manually initiate router connection to ROUTER C (VC call: caller, OPEN PDU: send). Confirm the X.25 VC and IDRP connection are established.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER C	4-10-2	Confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, confirm UPDATE PDU is received, and that route information to ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C to ROUTER A	4-10-3	Confirm that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A to ROUTER B and route addition	4-10-4	Confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, confirm UPDATE PDU is received, and that route information to ROUTER C is added.	OK / NG	/ /

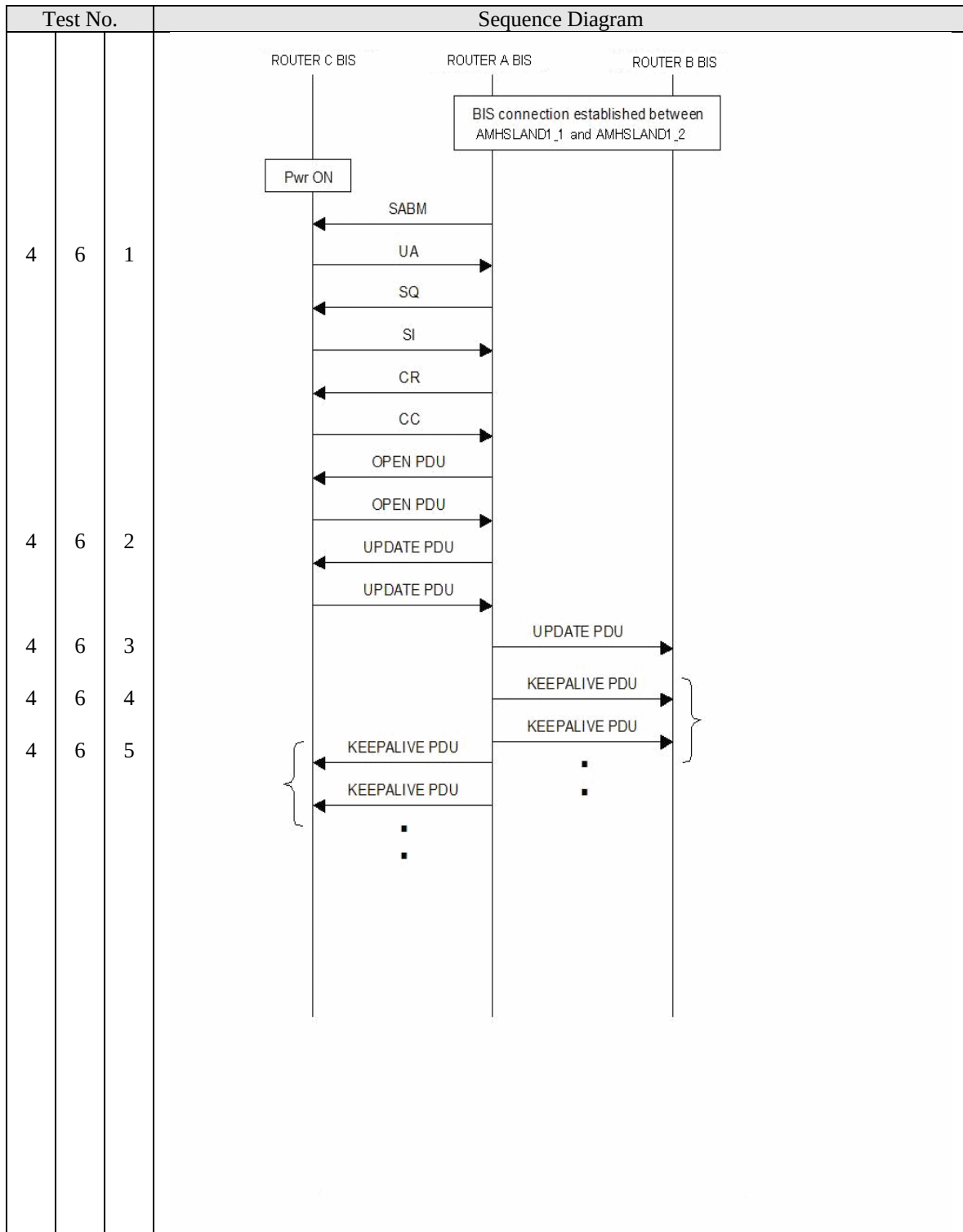


**Figure 21 Sequence: Router connection of ROUTER C to ROUTER A
(ROUTER B-ROUTER A already established)**

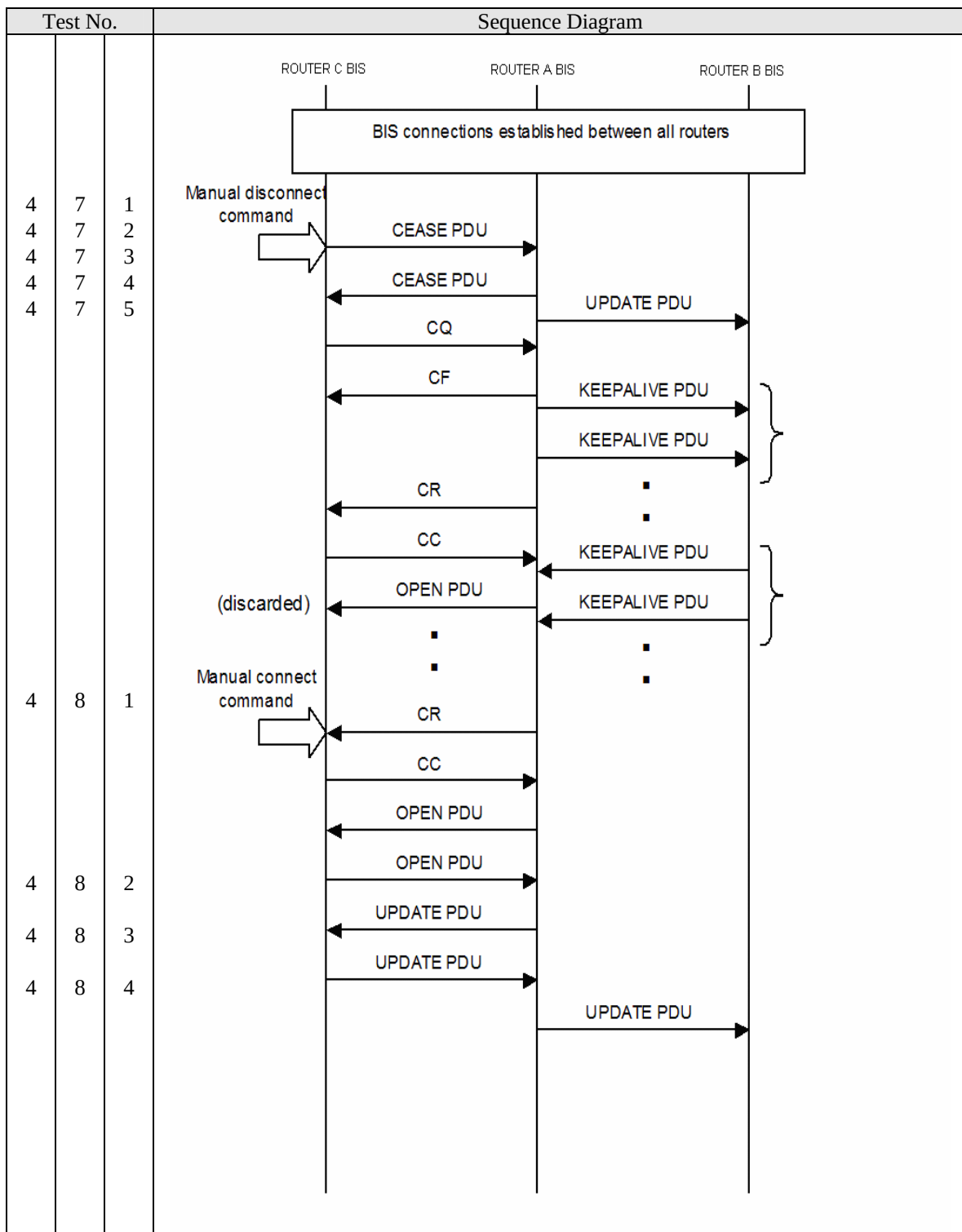


Figure 22 Sequence: Manual router disconnection at ROUTER C of ROUTER C-ROUTER A route and re-activation

Test No.			Sequence Diagram		
			<pre> sequenceDiagram participant C as ROUTER C BIS participant A as ROUTER A BIS participant B as ROUTER B BIS Note over C,A,B: BIS connections established between all routers A->>A: Manual disconnect command A->>C: CEASE PDU A->>C: CEASE PDU C->>A: CQ C->>A: CF A->>B: UPDATE PDU A->>B: KEEPALIVE PDU A->>B: KEEPALIVE PDU A->>B: . A->>B: . A->>B: KEEPALIVE PDU A->>B: KEEPALIVE PDU A->>B: . A->>B: . A->>C: CR A->>C: CC C->>A: OPEN PDU C->>A: OPEN PDU A->>C: UPDATE PDU A->>C: UPDATE PDU A->>B: UPDATE PDU </pre>		
4	9	1			
4	9	2			
4	9	3			
4	9	4			
4	9	5			
4	10	1			
4	10	2			
4	10	3			
4	10	4			

Figure 23 Sequence: Manual router disconnection at ROUTER A of ROUTER C-ROUTER A route and re-activation

Table 29 Communication Circuit Failure and Recovery Test Procedure: Third Domain connected to AMHSLAND1

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Carrier media failure of ROUTER A-ROUTER B circuit and route deletion	Data link and VC disconnection	4-11-1	Simulate carrier medium failure between ROUTER A and ROUTER B by disconnecting WAN cable from ROUTER B. Check and confirm data link and VC are disconnected between ROUTER A and ROUTER B.	OK / NG	/ /
	IDRP disconnection and route update	4-11-2	Check and confirm that IDRP connection between ROUTER A and ROUTER B is closed. At ROUTER A, check that route information for ROUTER B is deleted. At ROUTER B, check that route information for ROUTER A and ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-11-3	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check UPDATE PDU is received from ROUTER A, and that route information for ROUTER B is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER A-ROUTER B circuit and route addition	Data link, VC, and router connection re-establishment	4-12-1	Restore the ROUTER A-ROUTER B router connection. Confirm router connection is re-established between ROUTER A and ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER C are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER B	4-12-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER B sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER B, check that route information is added for ROUTER B.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-12-4	Check that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER B.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Carrier media failure of ROUTER C-ROUTER A circuit and route deletion	Data link and VC disconnection	4-13-1	Simulate carrier medium failure between ROUTER C and ROUTER A by disconnecting WAN cable from ROUTER C. Check and confirm data link and VC are disconnected between ROUTER C and ROUTER A.	OK / NG	/ /
	IDRP disconnection and route update	4-13-2	Check and confirm that IDRP connection between ROUTER C and ROUTER A is closed. At ROUTER C, check that route information for ROUTER A and ROUTER B are deleted. At ROUTER A, check that route information for ROUTER C is deleted.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A and route update	4-13-3	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that UPDATE PDU is received from ROUTER A, and that route information for ROUTER C is deleted.	OK / NG	/ /
Carrier media restoration of ROUTER C-ROUTER A circuit and route addition	Data link, VC, and Router connection re-establishment	4-14-1	Restore the ROUTER C-ROUTER A router connection. Confirm router connection is re-established between ROUTER C and ROUTER A.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-2	After IDRP connection is established, confirm that ROUTER A sends an UPDATE PDU to ROUTER C. At ROUTER C, check that an UPDATE PDU is received from ROUTER A, and that route information for ROUTER A and ROUTER B are added.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER C	4-14-3	After receiving UPDATE PDU from ROUTER A, check that ROUTER C sends an UPDATE PDU to ROUTER A. At ROUTER A, after receiving UPDATE PDU from ROUTER C, check that route information is added for ROUTER C.	OK / NG	/ /
	UPDATE PDU transmission from ROUTER A	4-14-4	Check that ROUTER A sends an UPDATE PDU to ROUTER B. At ROUTER B, check that an UPDATE PDU is received from ROUTER A, and that route information is added for ROUTER C.	OK / NG	/ /

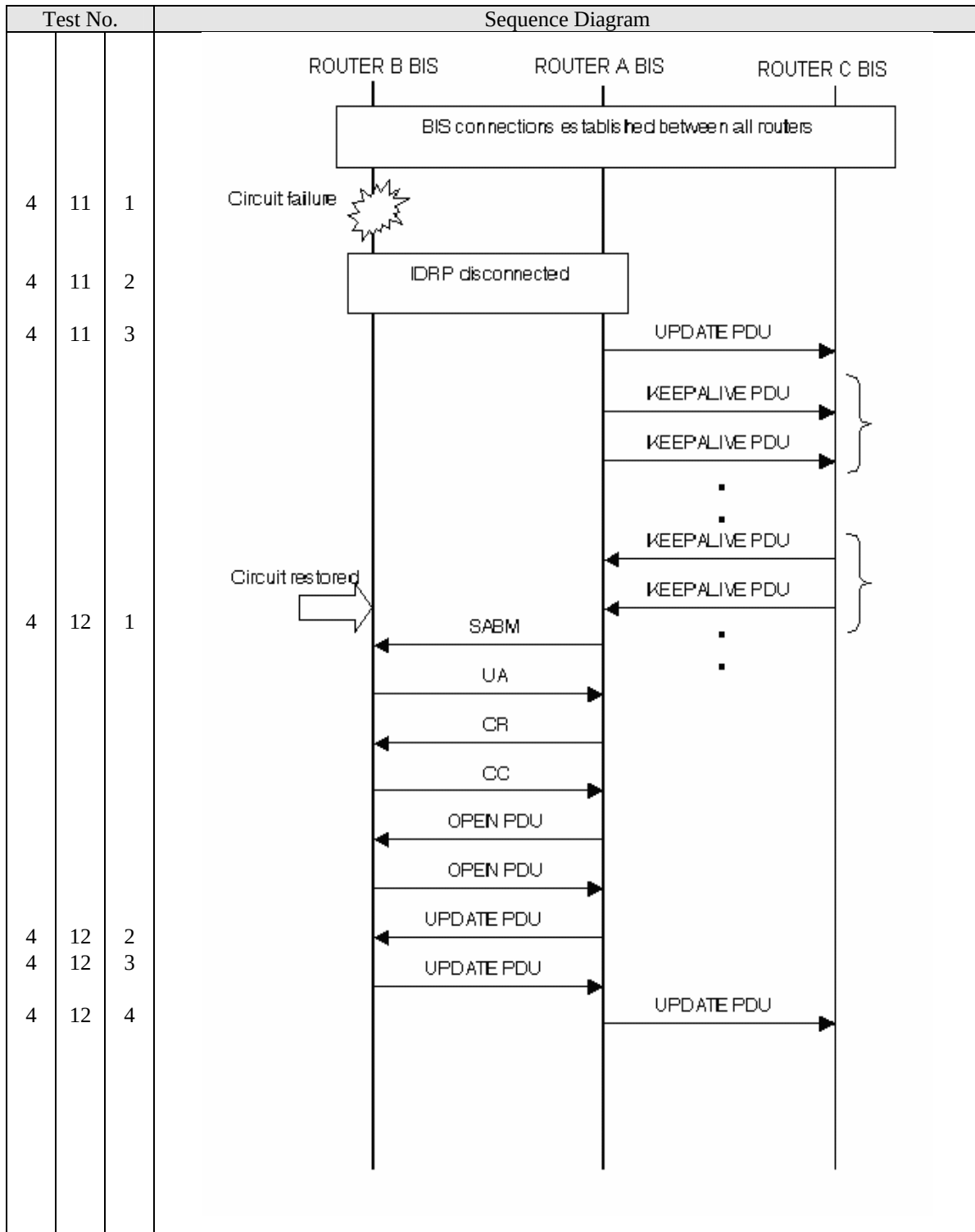


Figure 24 Sequence: Failure and recovery of ROUTER B-ROUTER A circuit

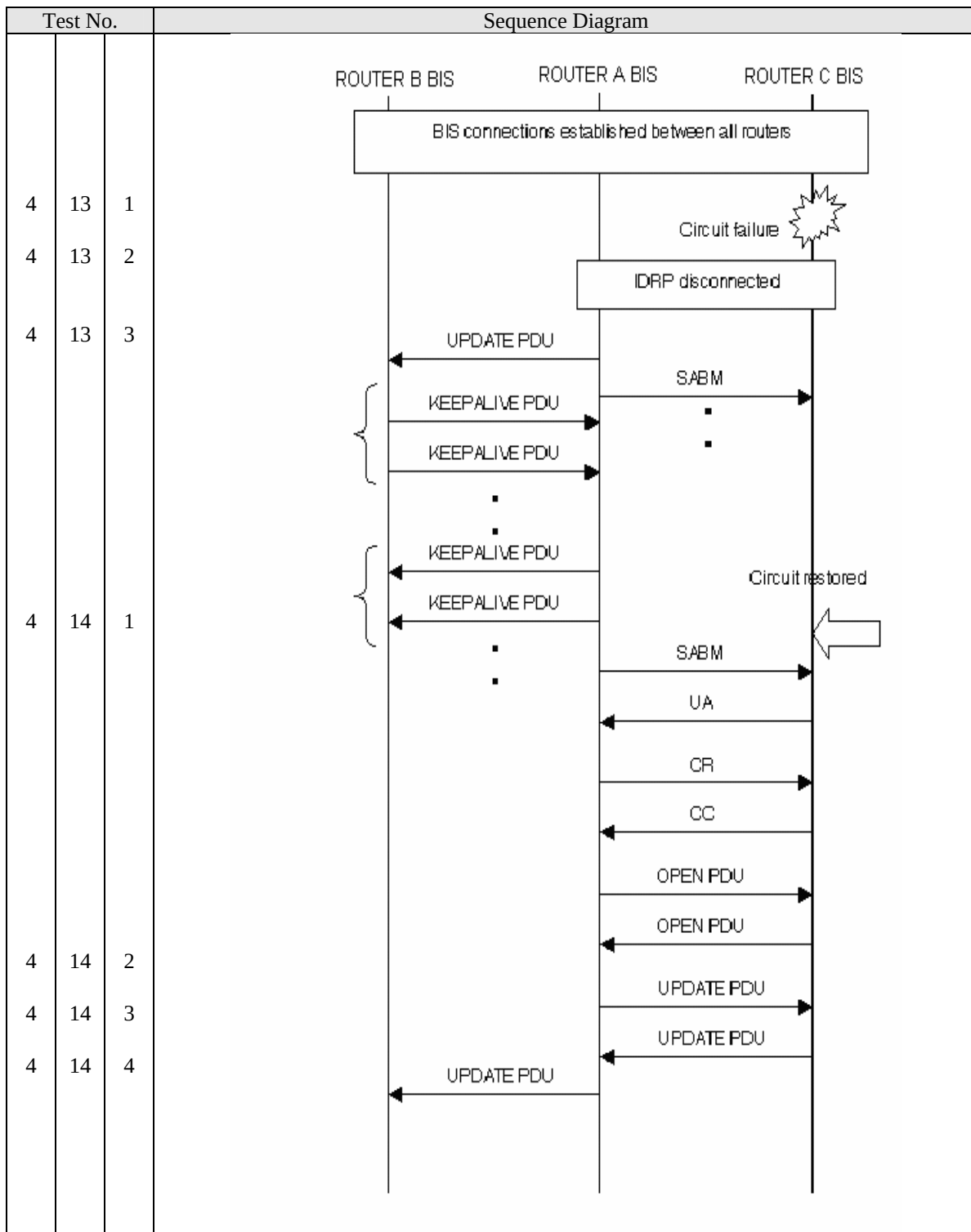


Figure 25 Sequence: Failure and recovery of ROUTER C-ROUTER A circuit

Table 30 Router Failure and Recovery Test Procedure

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
Failure and recovery of ROUTER C	Failure of ROUTER C	4-15-1	Simulate failure and recovery of ROUTER C by rebooting the router. At failure: - At ROUTER A, check that routing information for ROUTER C is deleted. - At ROUTER B, check that routing information for ROUTER C is deleted.	OK / NG	/ /
	Recovery of ROUTER C	4-15-2	Check that the ROUTER C-ROUTER A router connection is automatically re-established after ROUTER C recovers. After recovery: - At ROUTER A, check that routing information for ROUTER C is added. - At ROUTER B, check that routing information for ROUTER C is added.	OK / NG	/ /
Failure and recovery of ROUTER A	Failure of ROUTER A	4-16-1	Simulate failure and recovery of ROUTER A by forcing failover. At failure: - At ROUTER B, check that routing information for ROUTER A and ROUTER C are deleted - At ROUTER C, check that routing information for ROUTER A and ROUTER B are deleted.	OK / NG	/ /

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
	Recovery of ROUTER A	4-16-2	Check that the ROUTER C-ROUTER A and ROUTER A-ROUTER B router connections are automatically re-established after ROUTER A recovers. After recovery: • At ROUTER A, check that routing information is added for ROUTER C and ROUTER B. • At ROUTER B, check that routing information for ROUTER C and ROUTER A are added. • At ROUTER C, check that routing information for ROUTER A and ROUTER B are added.	OK / NG	/ /
Failure and recovery of ROUTER B	Failure of ROUTER B	4-17-1	Simulate failure and recovery of ROUTER B by rebooting the router. At failure: • At ROUTER A, check that routing information for ROUTER B is deleted. • At ROUTER C, check that routing information for ROUTER B is deleted.	OK / NG	/ /
	Recovery of ROUTER B	4-17-2	Check that the ROUTER A-ROUTER B router connection is automatically re-established after ROUTER B recovers. After recovery: • At ROUTER A, check that routing information for ROUTER B is added. • At ROUTER C, check that routing information for ROUTER B is added. • At ROUTER B, check that routing information for ROUTER A and ROUTER C are added.	OK / NG	/ /

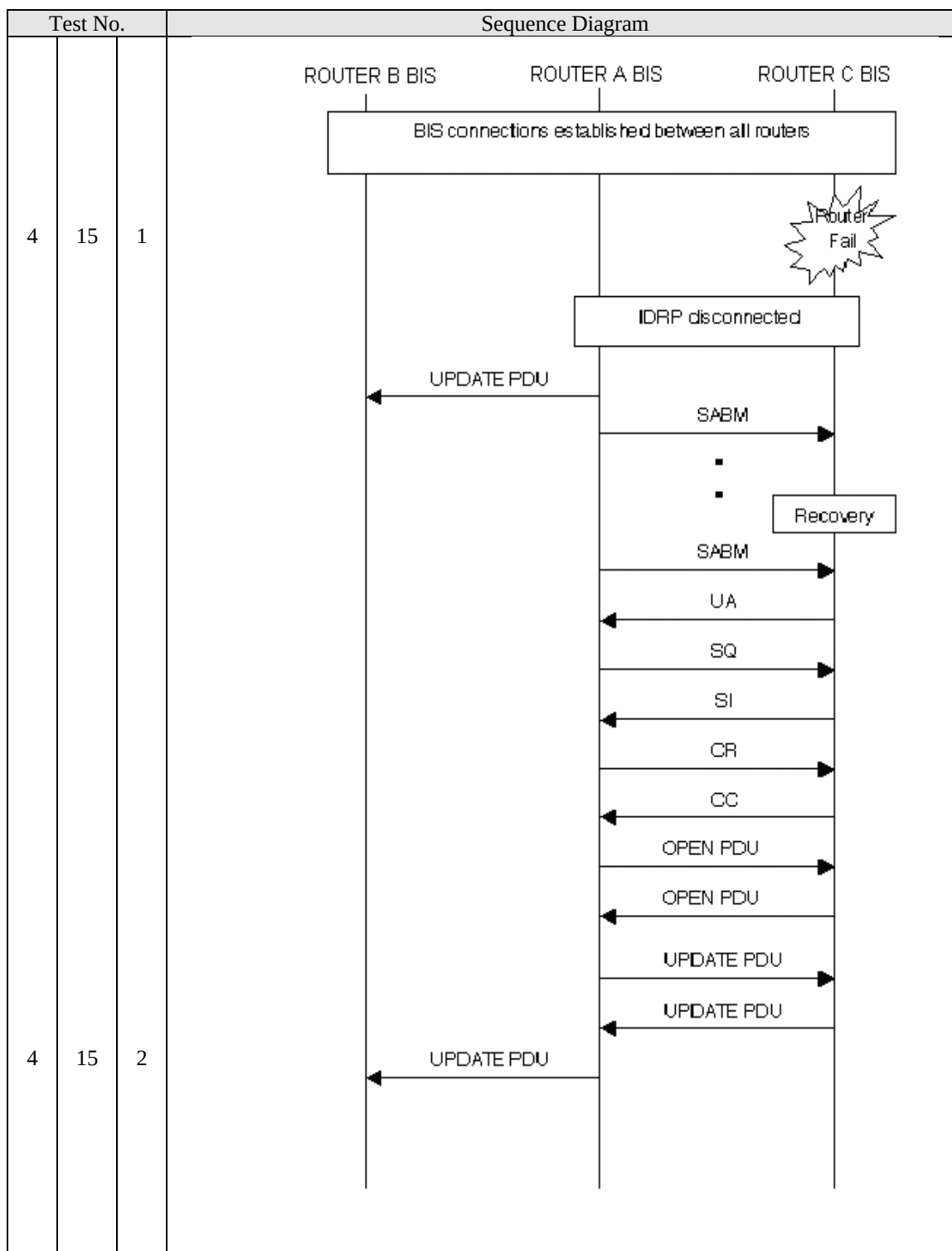


Figure 26 Sequence: Failure and Recovery of ROUTER C

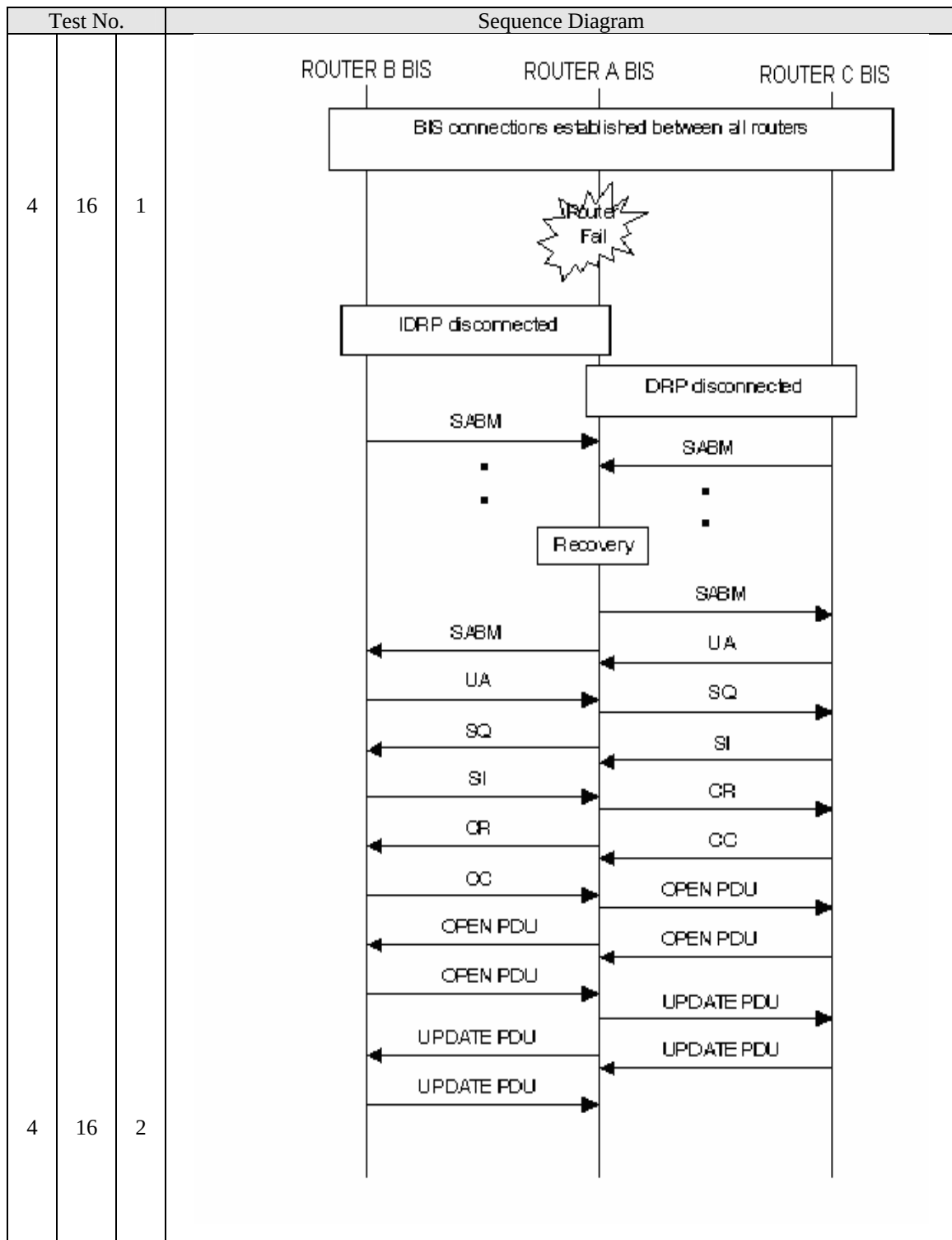


Figure 27 Sequence: Failure and Recovery of ROUTER A

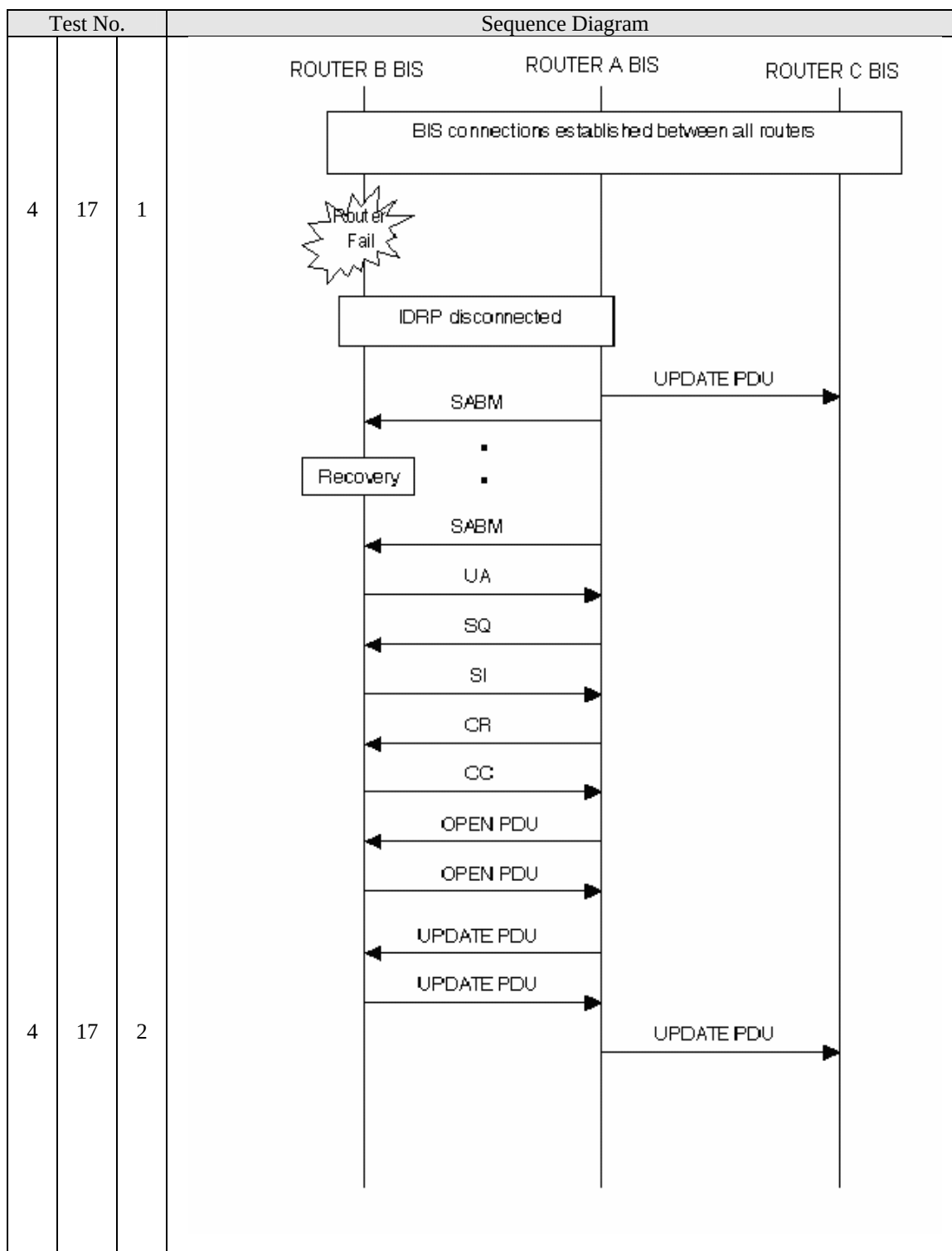


Figure 28 Sequence: Failure and Recovery of ROUTER B

Table 31 End-to-End CLNP Echo Test Procedure

4. ATN Router Tests		Test Item	Procedure	Result	Date/Time
End-to-End CLNP Echo Test between end systems in ROUTER C domain and ROUTER B domain	ERQ transmission	4-18-1	Send ERQ PDU from ES in ROUTER C domain to ES in ROUTER B domain. Confirm receipt of ERQ PDU at ES in ROUTER B domain.	OK / NG	/ /
	ERP transmission	4-18-2	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-3	Repeat 4-18-1 to 4-18-2 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /
	ERQ transmission	4-18-4	Send ERQ PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERQ PDU at ES in ROUTER C domain.	OK / NG	/ /
	ERP transmission	4-18-5	Send ERP PDU from ES in ROUTER B domain to ES in ROUTER C domain. Confirm receipt of ERP PDU at ES in ROUTER C domain.	OK / NG	/ /
	Continuous ERQ/ERP transmission	4-18-6	Repeat 4-18-4 to 4-18-6 ten times to confirm that there is no problem with ERQ/ERP transmission and relay through the ROUTER A.	OK / NG	/ /

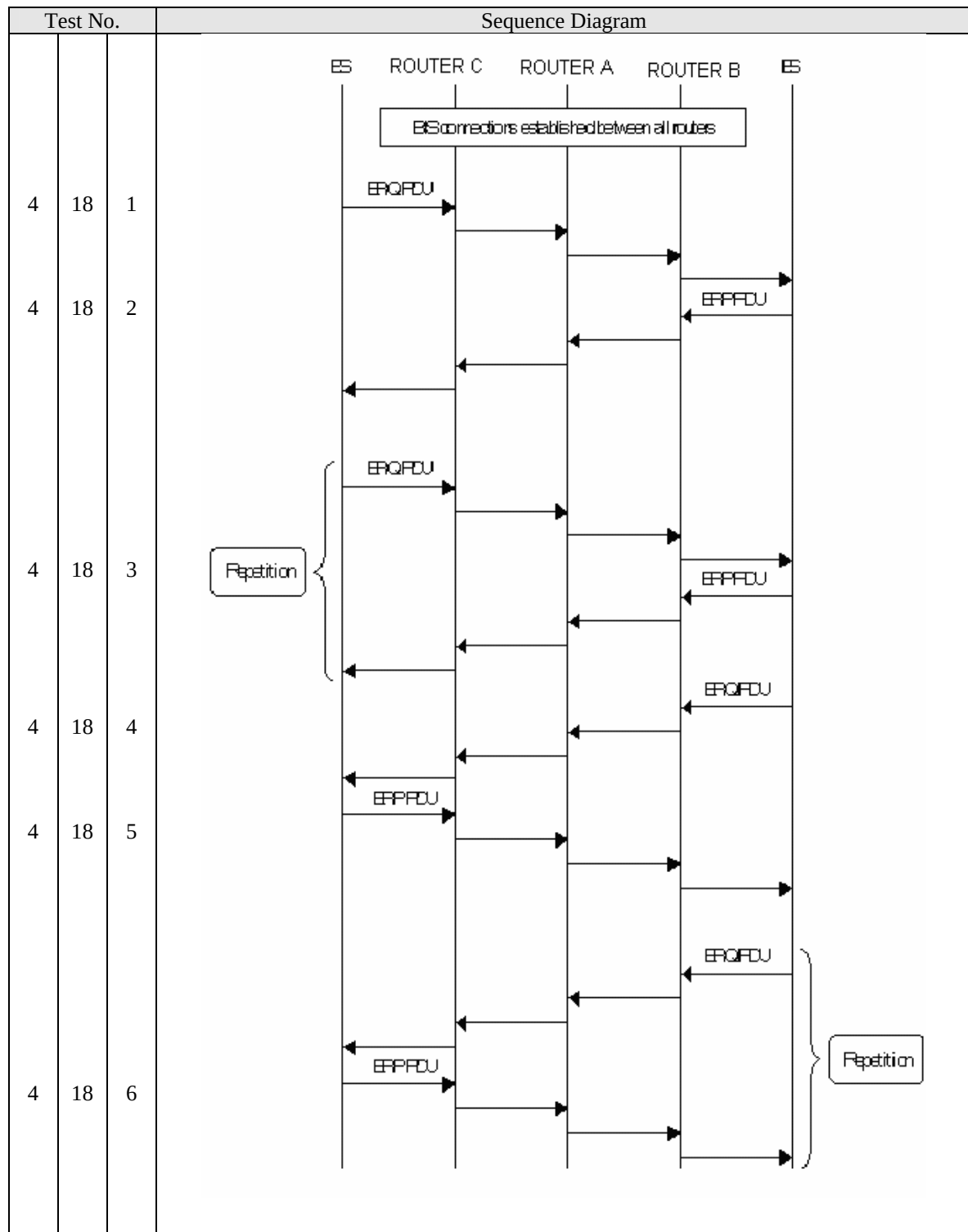


Figure 29 Sequence: End-to-End CLNP Echo Tests

- END -

ANNEX D

AMHS Testing Requirements

ANNEX D

of

AMHS Manual

Document Control Log

Edition	Date	Comments	Section/pages affected
1.0	22/06/2007	Creation of the document.	all
1.0	September 2007	Document is endorsed by APANPIRG/18	all
2.0	22/09/2008	Editorial updates – change of document version number	all

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1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional requirements for AMHS testing procedures.

1.2 Scope of the Document

Based on known principles of testing and general assumptions on an AMHS test scenario, the scope of testing for an "AMHS Conformance Test" is specified. Elements of the specifications are generic test groups and related test configurations. Special attention is given to the "provocation" of an AMHS implementation with incorrect protocol behavior ("negative testing") to analyze its stability (robustness) in out-of-line situations.

Further requirements are specified in terms of configuration parameters (as number of ATS Message Servers and AMHS users represented by test equipment) and the components of AMHS and AFTN information objects to be handled.

In principle, these groups are also valid for interoperability tests. But especially the test groups dealing with "negative testing" cannot be performed by real systems due to the nature of an implementation to avoid such exception situations.

1.3 Document Structure

Chapter 2 is concerned with general aspects of conformance testing and identifies the principal differences to interoperability testing. Key elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment. References are made to ISO/IEC 9646 which provides a general concept of conformance testing and to deliverables of the ACCESS study concerning AMHS testing.

Chapter 3 deals with the scope of AMHS functions to be tested and identifies reference points at AMHS implementations which should be accessible for testing. In addition, the used transport service for AMHS communications is identified and the interface with AFTN at the implemented AFTN/AMHS Gateway is detailed.

Chapter 4 defines AMHS test groups for comprehensive conformance testing of AMHS native communications and gateway operations with the AFTN. Related test configurations are added with explanations on sequences of exchanged AMHS and AFTN information objects. In addition, principles for definitions of test cases are set up including the consideration of so-called "negative testing".

Chapter 5 specifies the range of parameters values supported in test configurations which place quantitative requirements on the testing equipment as the number of represented adjacent ATS Message Servers and handled AMHS and AFTN users.

Finally, *chapter 6* identifies the used AMHS and AFTN test data. In particular, the elements of AMHS information objects and their sub-components (as message and message transfer envelope) to be supported are specified in detail.

1.4 References

- [1] ICAO DOC 9705-AN/956: The Manual of technical provisions for the ATN, Sub-volume III, Section 3.1 –Edition 3 (2002) – Referred to as AMHS SARPs
- [2] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [3] ISO/IEC 10021-2 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 2: Overall architecture
- [4] ISO/IEC 10021-4 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 4: Message Transfer System: Abstract service definition and procedures
- [5] ISO/IEC 10021-7 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 7: Interpersonal Messaging System
- [6] ISO/IEC ISP 10611-3 – International standardized profile AMH1n – Message Handling Systems – Common Messaging –AMH11: Message transfer (P1)
- [7] ISO/IEC ISP 12062-2 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH21: IPM content
- [8] ISO/IEC ISP 12062-3 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH22: IPM requirements for message transfer (P1)
- [9] ISO/IEC 9646-1 – Conformance testing methodology and framework – Part 1: General concept (1994)

2 Conformance Testing

The chapter provides an introduction to general aspects of conformance testing and identifies the principal differences to interoperability testing. Elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment. References are made to ISO/IEC 9646.

2.1 Objectives

Generally, conformance testing attempts to determine whether a given implementation matches a specification. The implementation to be tested is referred to as the *implementation under test (IUT)*. A tester provides the IUT with defined inputs and observes the resulting outputs. – ISO/IEC 9646-1 provides a general concept of OSI conformance testing and definitions of related key terms.

Note. – According to ISO 9646-1, the term *Implementation Under Test (IUT)* refers to an implementation of one or more OSI protocols, being part of a real open system which is to be studied. The *System Under Test (SUT)* is the real open system in which the IUT resides. – In the following, the term *IUT* is used when referring to the AMHS implementation to be tested in consideration that only the AMHS aspects within an given (real) ATS communication system are addressed.

ISO/IEC 9646-1 distinguishes three types of standardised conformance testing:

- *Basic interconnection tests*, that is to determine whether or not there is sufficient conformance to the relevant protocols for interconnection to be possible without trying to perform thorough testing.
- *Capability tests*, which are used to verify the existence of one or more claimed capabilities of an IUT (*static* conformance requirements).
- *Behaviour tests* deal with *dynamic* conformance requirements, which specify the observable behaviour of an implementation. Behaviour tests include tests for valid behaviour of the IUT for both valid and invalid inputs by the tester.

The AMHS testing requirements specified in this document focus on *behaviour tests*, i.e. test exercises address implemented AMHS functions in a way as they should be used. *Basic interconnection tests* are an appropriate means to check the correctness of a test configuration before starting detailed test exercises.

The discussed AMHS conformance testing relates to that scope of functions which is typically implemented in an *International Communication Centre*, i.e.

- 1) AMHS message transfer,
- 2) AMHS submission and delivery operations with attached AMHS user terminals and
- 3) Intercommunication with the AFTN/X.25 by means of the AFTN/AMHS Gateway.
The interface to the AFTN (X.25) is only taken into account in the extent as specified in the AMHS SARPs. For example, the AMHS SARPs do not assume AFTN routing by the gateway. – The Basic ATS Message Handling Service is assumed as the service level supported by the IUT.
The conformance testing equipment acting as peer system of the AMHS IUT is referred to the *AMHS Test Tool*. The AMHS Test Tool provides the IUT with inputs, records and evaluates responses of the IUT.
The specified testing requirements refer to an initial functionality of the AMHS Test Tool. Potential future extensions are indicated in the context of the specified sub-items of the test tool.

2.2 Specific aspects of AMHS testing

The AMHS (MHS) functions to be tested reside in the *application layer* of the ISO/OSI reference model. The underlying layers provide supporting communication services, however, are not primary subject of testing.

The context of AMHS conformance testing:

- (a) the testing of complete systems (“black boxes”) and
- (b) the testing of individual protocol layers, in particular the application layer.

In case (a) only external interfaces which are part of the IUT are used by the conformance testing equipment. In case (b), on the other hand, the IUT has to be “opened up”, providing the layer to be tested. For this purpose special software modules have to be provided within the IUT for control and observation of the lower and upper service boundary at the layer under test (see ISO/IEC 9646-1).

Recommendations for AMHS conformance testing are:

- the individual components and protocol layers of the IUT not be visible to the conformance testing equipment;
- access to the IUT by the test equipment is only via standard interfaces; and
- human readable terminal interfaces (as the Control Position of an AMHS gateway) are not accessed by the test equipment.

This recommended testing approach forms the baseline for the functional requirements placed on the AMHS Test Tool, as follows:

- The AMHS Test Tool will be interconnected with the IUT's external interfaces as far as they are standardised by the AMHS SARPs. Such standardised interfaces are the *AMHS transfer ports* and the *AFTN/X.25 interface*. The IUT is treated as a *black box*.
- Originations and receptions at user terminals have to be performed and observed by an operator who is familiar with the implemented HMI. From that follows that conformance testing needs certain operator assistance at the IUT. (The made assumptions on interfaces which are available at individual IUTs will be outlined by means of an IUT model.)

3 Assumed Test Scenario

3.1 AMHS Functionality of the IUT

3.1.1 AMHS SARPs provisions

The assumption is made that the IUT to be tested provides completely or partially the AMHS functionality as specified by the SARPs in support of the *Basic ATS Message Handling Service*. Figure 1 identifies the key elements of the AMHS which are addressed by SARPs. The figure shall also indicate that the majority of the AMHS functionality is specified by references to the MHS standard series ISO/IEC 10021 and the related profile documentation ISO/IEC ISP 10611 (Common Messaging) and ISP 12063 (Interpersonal Messaging).

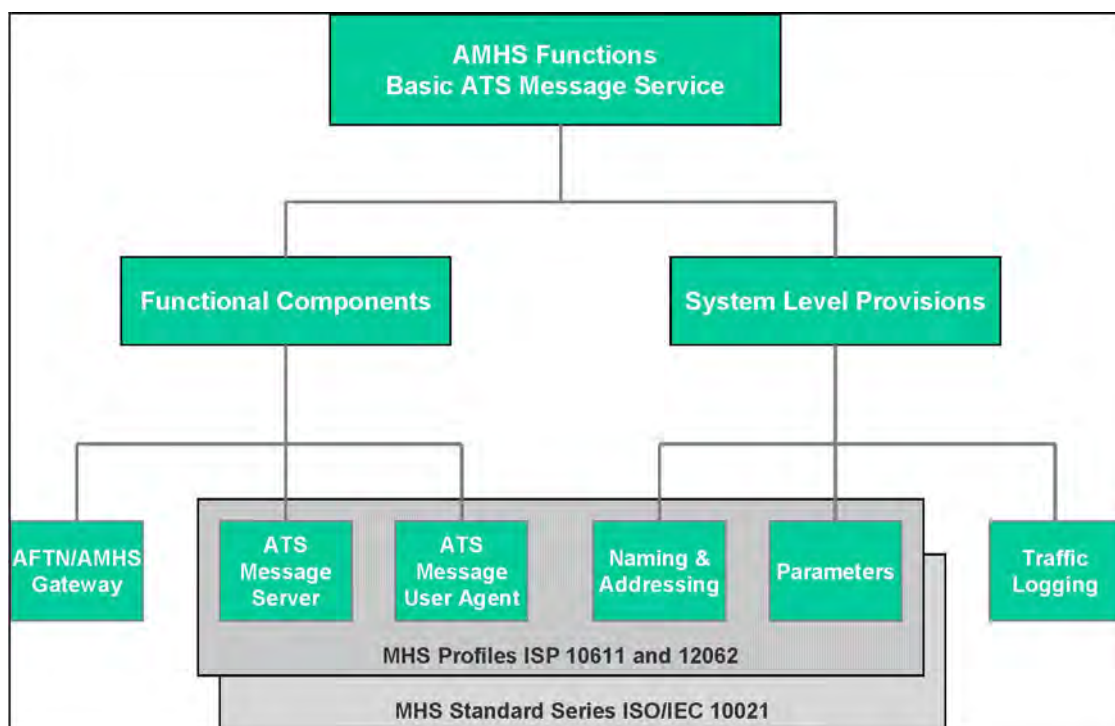


Figure 30: AMHS functionality specified by SARPs

The nucleus of the AMHS is formed by its three functional components:

- *ATS Message Server* performing *transfer* operations with adjacent *ATS Message Servers* (and *AMHS gateways*) by means of its inherent (MHS) *Message Transfer Agent (MTA)*. In addition, *submission* and *delivery* operations are performed with one or more attached *ATS Message User Agents*. Optional (MHS) *Message Stores (MS)* may provide retrieval services for *ATS Message User Agents* in connection with message delivery.
- *ATS Message User Agents* each including a (MHS) *User Agent (UA)* as key component. An *ATS Message User Agent* interacts on one side with a (local) *AMHS user interface* and accesses on the other side the transfer level of the *AMHS* by performing *submission* and *delivery* operations with the superordinated *ATS Message Server*. Communications between *ATS Message User Agents* (via *ATS Message Servers*) are end-to-end and have to comply with the *IPM* content as specified for the (MHS) *Interpersonal Messaging System (IPMS)*.

- *AFTN/AMHS Gateway* supporting interworking between users of the AMHS and AFTN. The gateway includes for operations with the transfer level of the AMHS and MTA. The mapping functions of the gateway reside in the Message Transfer and Control Unit (MTCU). The operations with AFTN are performed with the AFTN components. Exception handling which needs operator assistance is moved to the Control Position.

The above listed functional components are typically implemented in International Communication Centres performing AMHS message transfers, AMHS message submission and delivery operations with attached AMHS user terminals and intercommunications with the AFTN. However, an AFTN/AMHS Gateway may be also implemented as stand-alone facility allowing existing AFTN communication facilities access to the AMHS.

In addition, the AMHS SARPs address some aspects relating to the system level of an AMHS environment. The key ingredients at the system level of the AMHS are:

- *Naming and addressing* relating to the unambiguously identification of AMHS users and entities at upper layers protocols as needed for communications between AMHS systems. The specifications are based on MHS O/R addressing and ISO/OSI upper layer conventions. Examples are: the Common AMHS Addressing Scheme, Application Process Titles and Transport/Session/Presentation addresses.
- *Parameters* define specific AMHS conventions in the framework of the MHS standard. Examples are: The limitation of Receipt Notifications for IPMs with the *importance* value “high” and the definition of the ATS-Message-Header in the IPM body part.
- *Traffic logging* in functional components in support of message tracking across the AMHS.

The manner of implementation of the above identified AMHS functionality in the IUT is irrelevant for testing (*black-box* view). The above functional outline is used just as reference for the scope of conformance testing to be supported by the AMHS Test Tool.

3.1.2 Implementation specific AMHS features

Typically, an AMHS implementation includes features which are either beyond the scope of the SARPs or seen as local issue. Examples are: User interfaces (HMI) for local submissions and deliveries, proprietary MTS access protocol and provisions for systems management (including statistics and diagnostic means).

Such features will not be subject of conformance testing, however, may be used in support of conformance testing. Example: IPM submission at local user terminals for verification of correct generation of the related P1 message.

3.2 Modelling of the test environment

Figure 2 illustrates the intended operational environment of the IUT at the level of messaging: Via Transfer Ports of the IUT (logical) connections are established to n adjacent ATS Message Servers which in turn provide connectivity to m distant ATS Message User Agents. Local access to the AMHS is offered by p AMHS User Terminals attached to the IUT. Via the AFTN/AMHS Gateway there is a connection to an adjacent AFTN Communication Centre which in turn provides connectivity to s AFTN stations. – The figures m , n , p and s are seen as configuration parameters of the test configuration (see Section 5).

Note 1. – The specification of the AFTN/AMHS Gateway assumes an AFTN link to only one adjacent AFTN centre to minimise the AFTN functionality in the gateway. However, in typical implementations, the AFTN/AMHS Gateway is collocated with AFTN centre functions supporting connections to a number of adjacent centres. This aspect of multiple AFTN connections is not considered for conformance testing against the AMHS SARPs.

Note 2. – In the AISAPAC Region, AFTN communications make use of the X.25 transport service. This is taken into account for conformance testing, however, with the limitation, that only one X.25/AFTN link is established between the test tool and the IUT (see Figure 2).

Note 3. – In-depth testing of AFTN and X.25 capabilities of the IUT is not seen as subject of AMHS conformance testing.

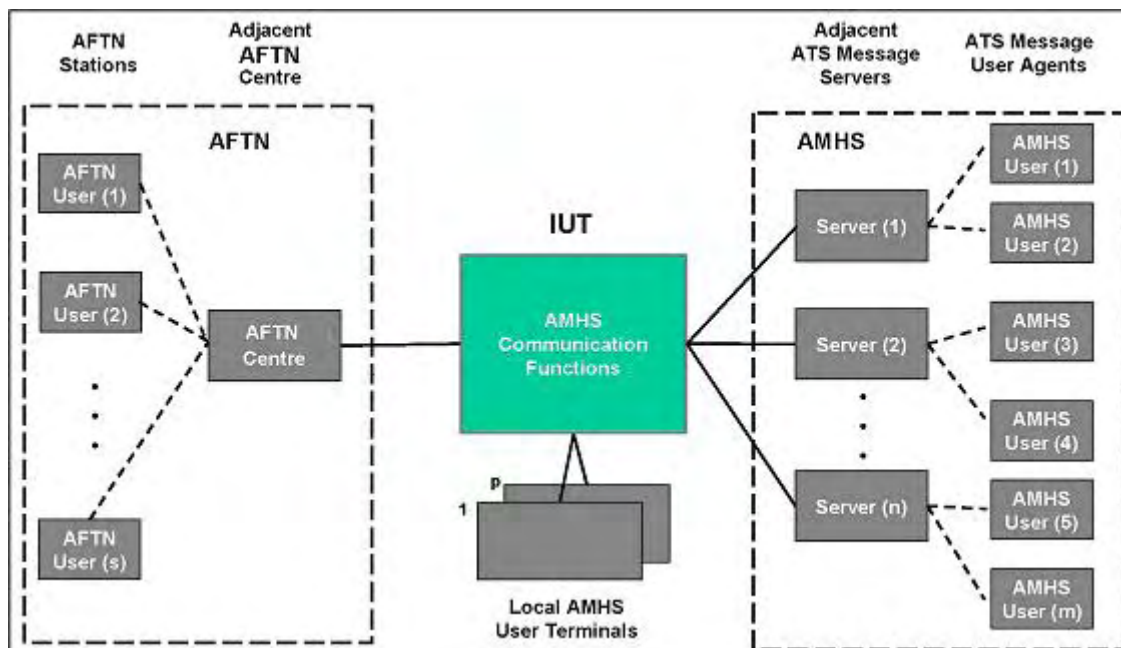


Figure 31: Assumed operational environment of the IUT

The AMHS Test Tool simulates an operational environment for the IUT as depicted in Figure 2. Figure 3 shows the corresponding model of the test configuration. The *COM Interfaces* of the test tool include n MTA instances representing the n adjacent ATS Message Servers of the IUT and an AFTN/X.25 source/sink representing the AFTN/X.25 environment. Other major functional components of the test tool are the *Test Repository* (containing predefined test scripts and associated test data), *Test Script Editor* (providing an HMI for specifications of test scripts and test data), *Test Log* (containing all the exchanged information objects) and *Test Evaluation* (performing test evaluations based on the test log against various criteria). The *Test Driver* controls the execution of test scripts and enters exchanged information objects in the test log. Finally, the component *Test Management* is tasked with the overall management and administration of the test tool.

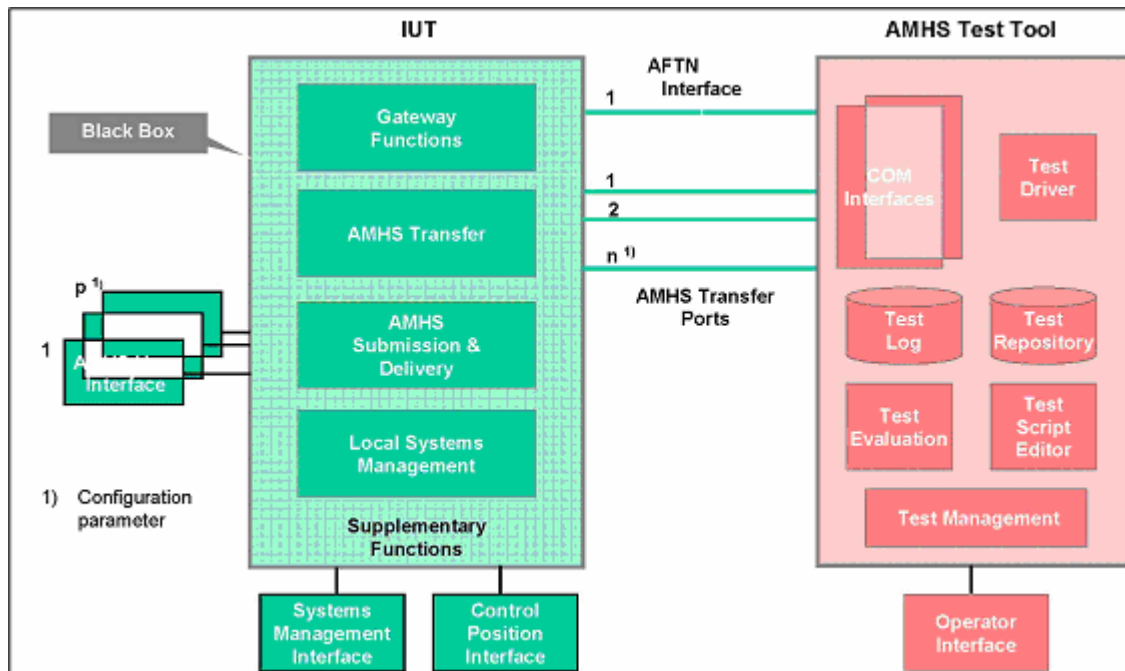


Figure 32: Model of the test environment

The IUT is represented in the modelled test configuration (*Figure 3*) by its functional components which will be subject of testing, i.e. AMHS transfer, AMHS submission/delivery and AMHS gateway functions (cf. Section 3.1). The inclusion of other indicated components of the IUT (as Systems Management Interface) will be addressed in subsequent sections.

The n MTA names, the addresses of the m ATS Message User Agents, s AFTN stations and p AMHS User Terminals are considered as configuration parameters which are jointly set up in the IUT and AMHS Test Tool.

Note. – The above outlined functional model includes an abstract, logical view on the AMHS Test Tool for the purpose of understanding the intended testing approach. The real design of the test tool is subject of separate documentation.

3.3 Used Transport Service for AMHS

According to the AMHS SARPs AMHS communications make use of the *ATN Internet Communications Service* (Layer 4). The ISO Transport Service of the class TP0 will be provided over a TCP/IP stack by using the convergence function defined with RFC 1006. The AMHS communications in the test configuration follow this approach.

Note. – Further extensions of the AMHS Test Tool may also support the ATN internet communications Service (aspect of inter-Regional or boundary centres) and TP0 over X.25.

3.4 Communication with the AFTN

The AMHS SARPs specify for the AFTN/AMHS Gateway an AFTN interface by referring to Annex 10, Volume II, i.e. the (asynchronous) *AFTN Teletypewriter Procedures* apply.

Note. – Extensions of the AMHS Test Tool may also support AFTN asynchronous communications and/or AFTN over X.25.

3.5 Points of Reference for testing

With the black-box view at the IUT, the verification of implemented functionality is limited to test inputs and examinations of resulting responses at external (open) interfaces of the IUT. Standardised interfaces of the IUT are directly interfaced by the AMHS Test Tool. At nonstandardised (proprietary) user interfaces of the IUT observations of operator inputs and displayed information are needed. Example: Origination of IPMs to be submitted or presentations of delivered IPMs at local AMHS user interfaces.

Such interfaces of the IUT which are used for conformance testing are referred to as *points of reference*. In the following, these points of reference will be detailed with reference to Figure 3.

3.5.1 Standardised points of reference

3.5.1.1 AMHS Communications

The IUT shall offer *Transfer Ports* for P1 communication with n adjacent ATS Message Servers. The lower protocol layers (layers 1 to 4) shall be configured as indicated below:

Layer 4	Layer 3	Layer 2	Layer 1
ISO TP0 RFC 1006 TCP	IPv4	ISO LLC1	10/100 Base T (Ethernet)

Table 32: Lower protocol layers (AMHS communications)

The Transfer Ports of the IUT and AMHS Test Tool shall be physically interconnected via a LAN (Ethernet).

3.5.1.2 AFTN/X.25 Communications

The IUT should offer a X.25/AFTN interface. That means, the IUT conveys AFTN-formatted messages by using the X.25 transport service.

Note. – If the IUT supports only AFTN asynchronous communications or AFTN over X.25 the "Extensions" of the AMHS Test Tool has to be used. The conformance testing is independent from the physical connection used.

3.5.2 Proprietary points of reference

The scope of conformance testing includes submission and delivery operations with local *AMHS user interfaces* of the IUT. Notifications for specified out-of-line situations shall be sent to the *Control Position* of the AFTN/AMHS Gateway. Further, traffic logs generated by the IUT during test exercises have to be verified against the AMHS SARPs by means of retrieval services provided at the IUT's *Operator Positions*.

The style of input and presentation of test data at the above identified three working positions is seen as a local implementation matter and is, therefore, out of scope of conformance testing. The inclusion of these working positions in testing is limited to observation and interpretation of test data.

Next, the handling of the three types of working positions will be discussed in more detail.

3.5.2.1 AMHS user interface

AMHS user interfaces provided at the IUT allow submission of IPMs and Probes and in the opposite direction delivered IPMs, IPNs and Reports have to be brought to the attention of AMHS users. The style of origination and presentation of the mentioned AMHS information objects is seen as subject of implementation. The inclusion of submission and delivery operations in conformance testing requires observations of operator interaction during test exercises.

Note. – Although the MTS access is seen as an implementation matter when supporting only the Basic ATS Message Handling Service, conformance testing shall verify the correct mapping of originated information objects onto P1 information objects; vice versa delivery operations have to map P1 information objects onto displayed objects in a correct manner.

3.5.2.2 Control Position

There is an AMHS SARPs requirement to notify the Control Position of the AFTN/AMHS gateway on specified deviations from the gateway's normal operations. Notifications may be issued for the operator information only or may require operator assistance for recovery from an occurred communication problem. How the Control Position is implemented is out of scope of the AMHS SARPs. However, the correct presentation of notifications at the IUT's Control Position is seen as subject of conformance testing. Appropriate observations have to accompany certain exercises.

3.5.2.3 Access to systems management functions

Access to IUT's systems management functions by means of a related working position shall be possible for:

Preparation of the IUT for the test configuration, and • verification of traffic logs generated by the IUT during test exercises.

4 Supported Scope of Conformance Testing

4.1 General aspects

The scope of testing covers the (native) AMHS communications and interoperations with the AFTN/X.25 by means of the AFTN/AMHS Gateway. The AFTN/X.25 interface is tested for verification of the gateway's capability to intercommunicate with AFTN/X.25, however, is not subject of dedicated conformance testing.

Communication services at lower communication layers (as TCP/IP, X.25, LAN) support the interconnection between the AMHS system and the AMHS Test Tool. In this way, lower communication layers will be included in the test tool, however, there is no intention performing lower layer protocol testing.

The following aspects of conformance testing shall be taken into account:

- *Protocol testing*, encompassing intra-AMHS communications (MTS, IPMS) and AMHS to AFTN/X.25 mappings (and vice versa).
- *Functionality testing*, to ensure the appropriate implementation of AMHS functionality and services (as message submission, transfer, delivery) including the correct mappings between AMHS information objects and user data made visible at users' working positions.
- *Resilience testing*, particularly with regard to the stability of an AMHS implementation against external communication failures.

The reference specification for AMHS testing is the *Basic ATS Message Handling Service* as specified in the AMHS SARPs.

Note. – The incorporation of the *Extended ATS Message Handling Service* shall be conceptually taken into account in a later extension of the AMHS testing requirements.

Below, the scope of conformance testing will be specified by definitions of generic *test groups* and related *test cases*. These definitions should be seen as a base (minimum) set which do not exclude testing using other equivalent or extended test arrangements.

4.2 Generic test configuration

The scope of AMHS functions expected from the IUT is defined firstly by the implemented AMHS *functional components*, i.e. ATS Message Server, AFTN/AMHS Gateway and ATS Message User Agent and secondly by supplementing *system level provisions* as AMHS naming/addressing, AMHS parameters and AMHS traffic logging (see Section 3.1).

Figure 4 places the above three functional components in a fictitious AMHS communication scenario with flows of AMHS information objects between two (*direct*) AMHS users. In addition, an AFTN/AMHS Gateway supports intercommunications with AFTN users (i.e. *indirect* users of the AMHS). The position of the gateway in Figure 4 should be seen just as an example.

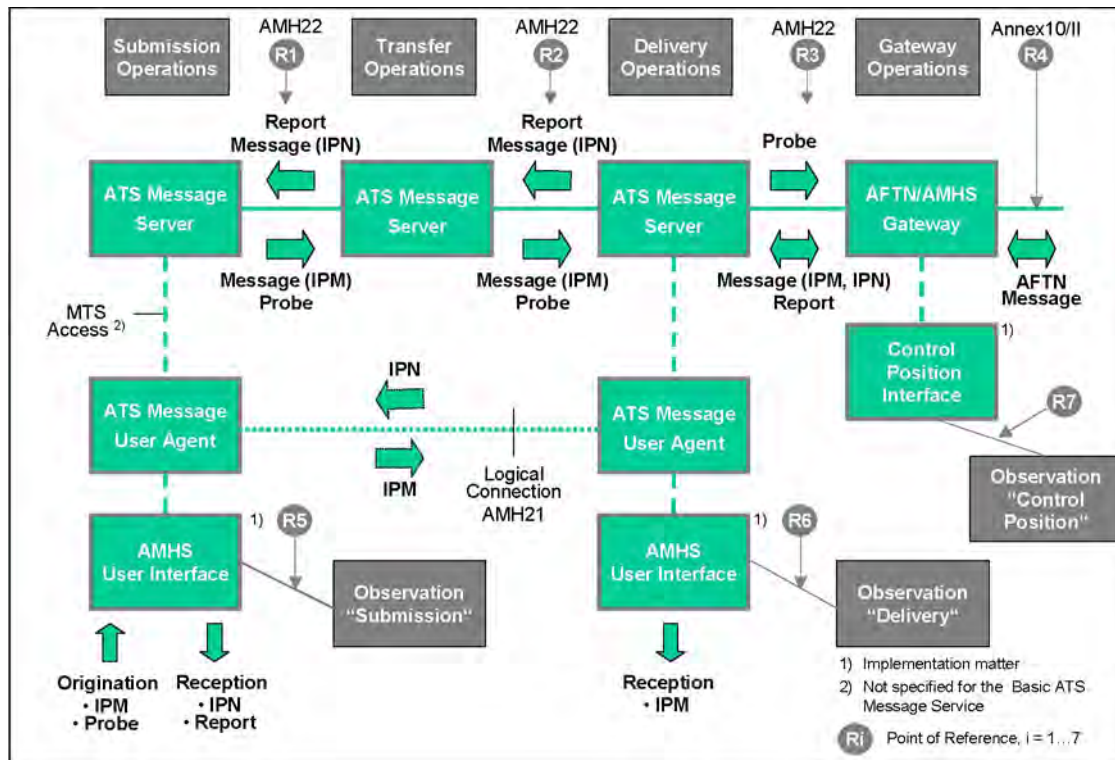


Figure 33: Generic AMHS communication scenario and used Points of Reference for conformance testing

The points of references *R1* to *R7* (in Figure 4) are allocated to the communication scenario according to the principles which have been stated in Section 3.5. The points *R1* to *R3* correspond to communication interfaces which are addressed by the MHS profiles AMH11 or AMH22, respectively [6], [8]. The exchange of IPMs and IPNs between the pair of ATS Message User Agents is subject of the MHS profile AMH21 [7]. Communications at the point *R4* follow the procedures laid down in Annex 10, Volume II, as far as applicable for the AFTN/AMHS Gateway.

The IUT is required to provide the communication functions of the ATS Message Server, ATS Message User Agent and AFTN/AMHS Gateway in any of their positions indicated in Figure 4. For related conformance testing the IUT is placed in various positions of the communication scenario (Figure 4) and the AMHS Test Tool performs the functions of the corresponding AMHS peer entity (entities). The resulting generic test configuration is depicted in Figure 5. The allocated points of reference *R1* to *R7* correspond to them of Figure 4. The reference point *R8* is added for identification of the IUT's systems management interface (see Section 3.5.2.3).

Note. – In consideration of testing implementations of the Basic ATS Message Handling Service no point of reference is allocated to the MTS access.

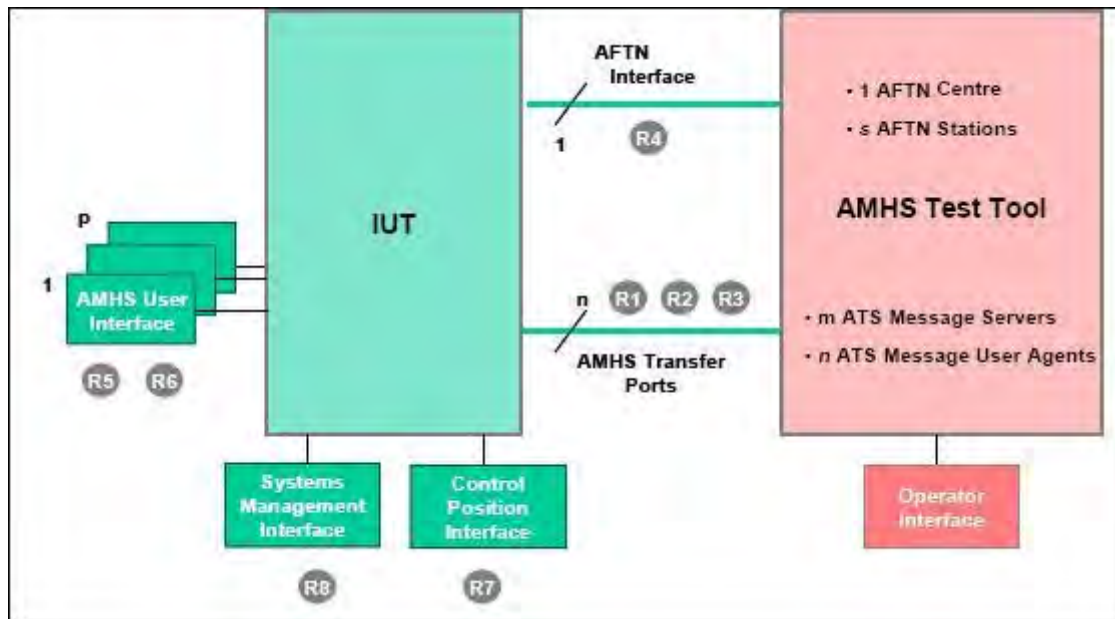


Figure 34: Generic test configuration with points of reference

Note. – In Figure 5 no AFTN user interface is forming part of the IUT. Such interfaces are outside of the scope of the specified AMHS functionality and are placed, therefore, in the IUT's test environment surrounding the IUT (see Figure 2). When testing AFTN/AMHS Gateway functions of the IUT the AFTN peer entities are always represented by the AMHS Test Tool. The AFTN related user actions should be performed by the AMHS Test Tool itself.

4.3 Definition of test groups

Generally, *test groups* provide a logical high-level ordering in test specifications (ISO 96462). Typically, a single test group addresses a particular functional area for which an IUT claims conformance. In the following, AMHS test groups are defined for the purpose of specification of high-level requirements placed on an AMHS Test Tool.

Figure 4 identifies four types of AMHS functional areas to be supported by the IUT: *Submission*, *Transfer*, *Delivery* and *Gateway* Operations. These types of AMHS operations will constitute a first set of test groups. A second set of test groups is formed by the provisions at the AMHS system level as referred to in Section 3.1.1, i.e. *Naming & Addressing*, *Parameters* and *Traffic Logging*.

The defined test groups reflect the external view at the IUT's functionality and are independent of the chosen implementation model. Below, the defined test groups are handled in detail.

For each of the handled test groups the correspondent test configuration is indicated. These test configurations are of generic nature. In practice, test configurations may be combined for study of local interworking between functional areas in an IUT. Example: Combined test exercises for message submission and local gateway functions.

4.3.1 Submission operations

Subject of the test group *Submission* operations is the origination of *IPMs* and *Probes* at AMHS user interfaces at the IUT and the related generation of *P1 information objects* for transfer to adjacent ATS Message Servers; returned *Reports* and *IPNs* have to be displayed at the IUT in an appropriate manner (see Figure 4).

Figure 6 depicts the test configuration for verification of the *Submission* operations. The test configuration follows from Figure 4 and Figure 5.

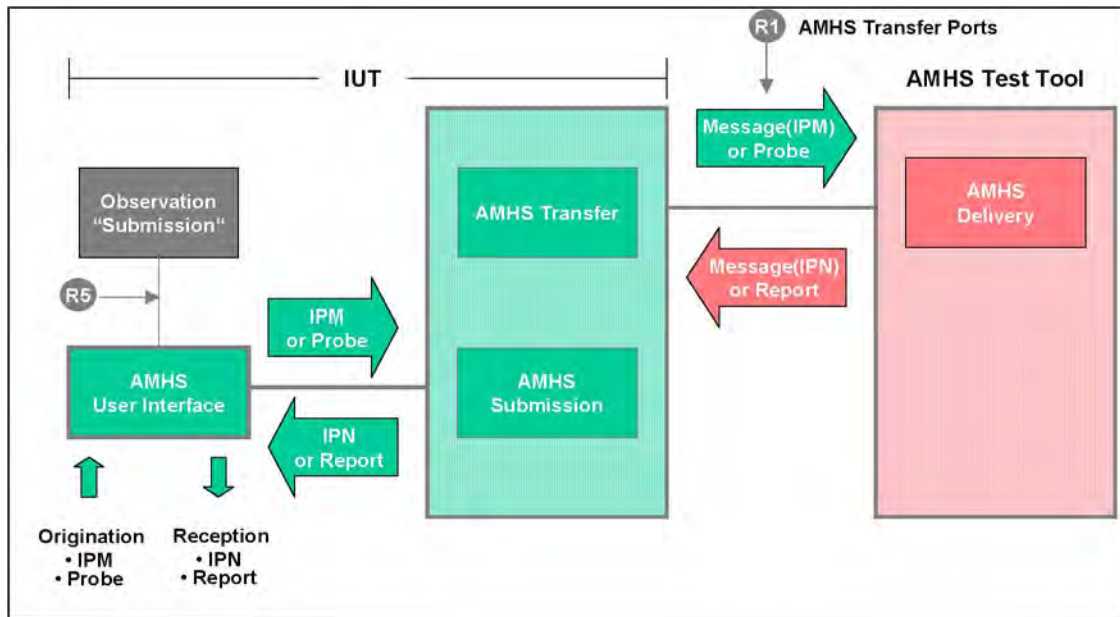


Figure 35: Test configuration “Submission”

For testing of the *Submission* operations the following actions may be performed:

- At an AMHS user interface of the IUT (reference point R5 in Figure 6) predefined IPMs and Probes are originated for intended recipients. The AMHS Test Tool at the transfer ports of the IUT (R1) verifies the correct generation of the related Messages (IPMs) and Probes.
- In the opposite direction, the AMHS Test Tool responds at the transfer ports of the IUT (R1) with valid and invalid Messages containing IPNs (upon IPMs) and Reports (upon IPMs and Probes). The presentation of valid IPNs and Reports is observed at the originator's AMHS user interface (R5). Invalid responses may effect error notifications at an operator position of the IUT (fault management).

Note. – The local rejection of erroneous originations of IPMs and Probes at IUT's user interfaces is seen as a local implementation matter and is, therefore, out of the scope of conformance testing.

4.3.2 Transfer operations

Subject of the test group *Transfer* operations is the transfer of P1 information objects (i.e. Message, Report, Probe) by the IUT. Rejected transfers of messages and probes have to be indicated by returning of Non-Delivery Reports (NDR). The test group includes handling of multiple recipient addresses (multiple dissemination) and the expansion of Distribution Lists (DLs).

Figure 7 depicts the test configuration for verification of the *Transfer* operations. The test configuration follows from Figure 4 and Figure 5.

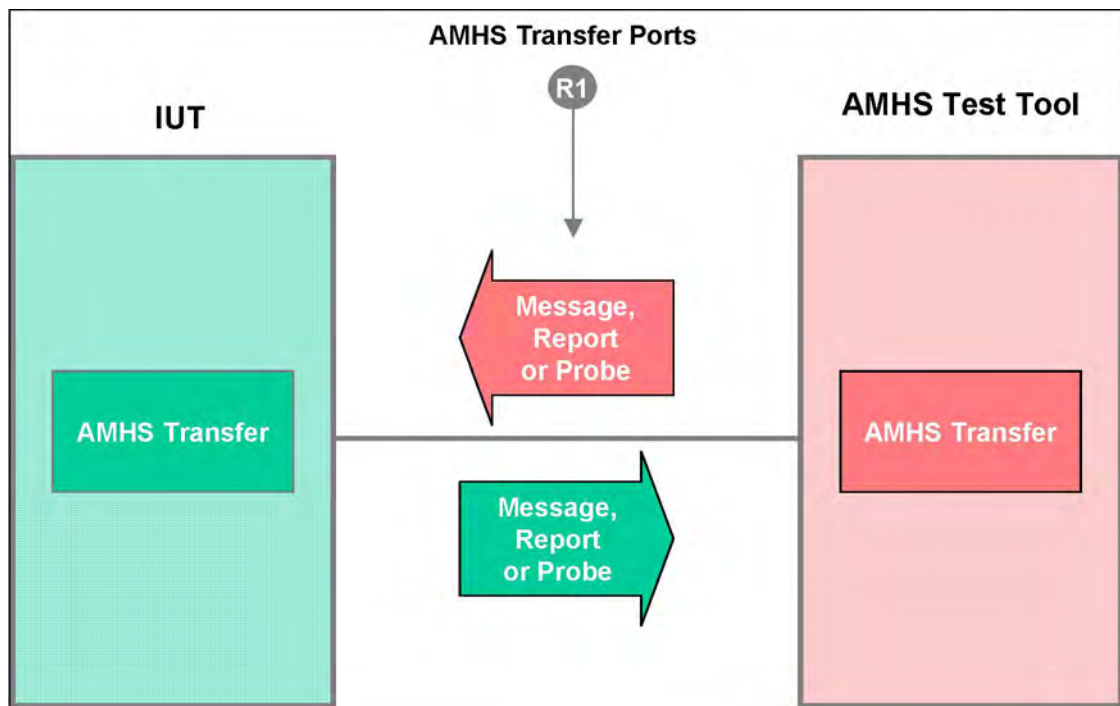


Figure 36: Test configuration “Transfer”

For testing of the *Transfer* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 7) with valid and invalid Messages (containing IPMs or IPNs), Reports and Probes with recipient addresses which are *not* local to the IUT.
- The IUT responds at its transfer ports (*R1*) with the output of one or more Messages, (due multiple dissemination and/or DL resolution), one or more Probes (multiple dissemination) or just the received Reports. The AMHS Test Tool verifies the expected IUT behaviour. Invalid information objects generated by the AMHS Test Tool may effect error notifications at an operator position of the IUT (fault management).

4.3.3 Delivery operations

Subject of the test group *Delivery* operations is the display of received Messages (IPMs) at AMHS user interfaces of the IUT. In addition, the IUT shall generate Reports (DR, NDR) and/or IPNs (RN, NRN) according to the requests contained in the received Messages and Probes.

Figure 8 depicts the test configuration for verification of the *delivery* operations. The test configuration follows from Figure 4 and Figure 5.

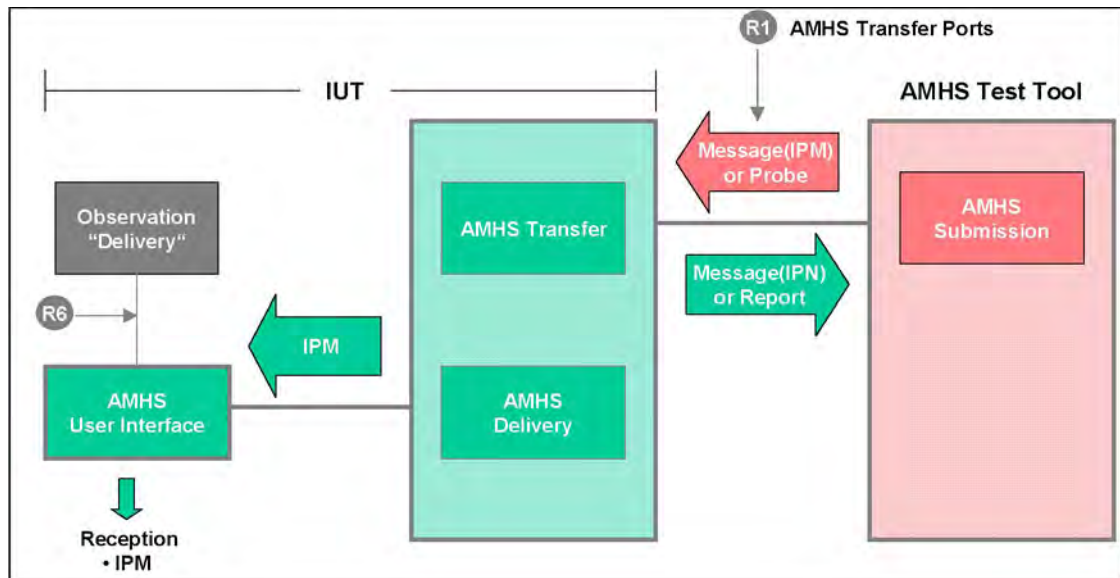


Figure 37: Test configuration “Delivery”

For testing of the *Delivery* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 8) with valid and invalid Messages (containing IPMs) and Probes, both with recipient addresses which are local to the IUT.
- The IUT may respond with one or more of the following actions:
 - Display the received IPM at the appropriate AMHS user interface (*R6*),
 - Returning a Message (IPN) at its transfer Port (*R1*) according to the given *receipt notification request* in the subject IPM,
 - Returning a Report (DR or NDR) at its transfer ports (*R1*) according to the given *report request* in the subject Message or Probe.

4.3.4 Gateway operations

Subject of the test group *Gateway* operations is the bi-directional conversion between AMHS and AFTN user messages and the handling of accompanying service information, i.e. AFTN service messages (SVC), AFTN SS acknowledgements (SS ACK), AMHS Reports and AMHS Receipt Notifications. – Cf. AMHS SARPs [1] para. 3.1.2.3.2.1.4.

Considering the functional complexity of the AFTN/AMHS Gateway, the test group is logically subdivided in three sub-groups: 1) Flow of user message from AMHS to AFTN, 2) Flow of user message from AFTN to AMHS and 3) Handling of Probes. The sub-groups 1) and 2) include the handling of accompanying service information.

4.3.4.1 User Message from AMHS to AFTN

Figure 9 depicts the test configuration for verification of the *Gateway* operations for the flow of a user message from AMHS to AFTN. The test configuration follows from the Figure 4 and Figure 5.

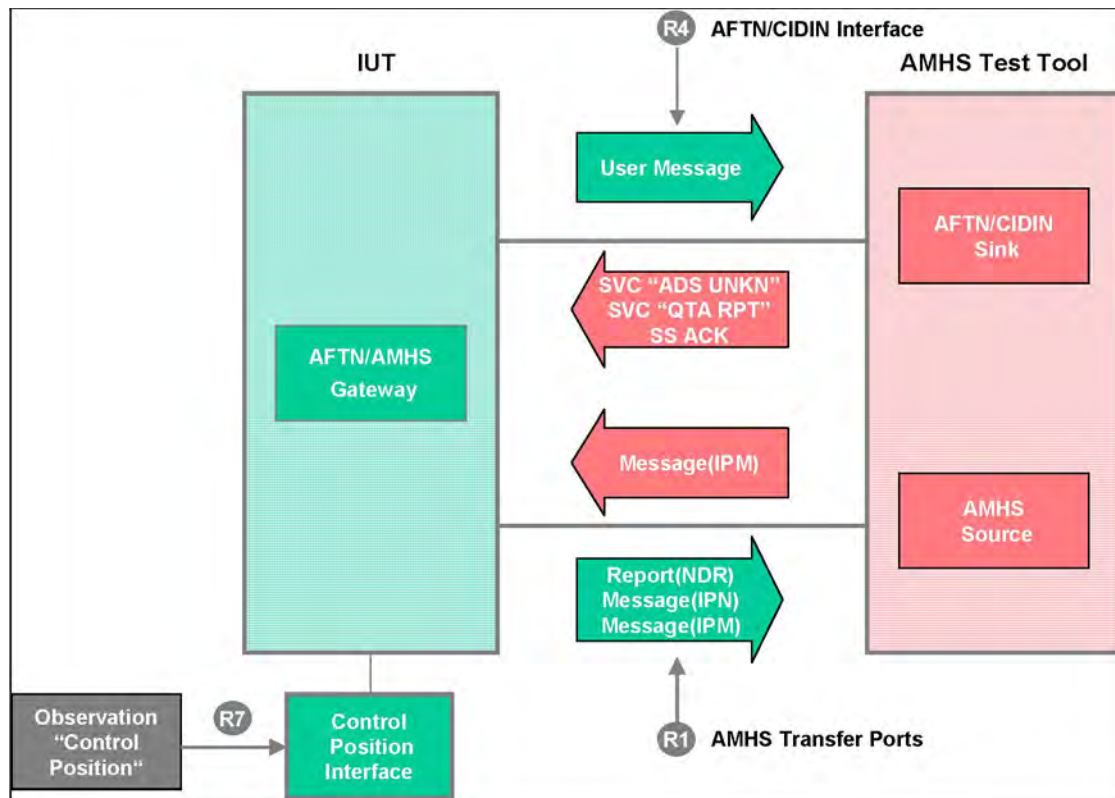


Figure 38: Test configuration “Gateway” – User message from AMHS to AFTN

The following actions may be performed with the Gateway test configuration depicted in Figure 9:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 9) with valid and invalid AMHS Messages containing IPMs. The IUT converts valid AMHS Messages in AFTN user messages which leave the IUT at its AFTN/X.25 interface (*R4*), invalid AMHS Messages are rejected by the IUT with Non-Delivery Reports (NDR) which are returned to the AMHS Test Tool using the IUT's transfer ports (*R1*).
- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an AFTN SVC “ADS UNKNOWN” simulating the detection of an unknown destination address within the AFTN. The IUT converts the SVC “ADS UNKNOWN” in a Non-Delivery Report (NDR). In exceptional situation, the SVC “ADS UNKNOWN” is encapsulated by the IUT in an IPM. The NDR or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).
- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an SS ACK. The IUT converts the SS ACK in an IPN of the type Receipt Notification (RN). In exceptional situation, the SS ACK is encapsulated by the IUT in an IPM. The IPN or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).

The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (*R4*) with an SVC “QTA RPT” requesting the repetition of an AFTN message sent before to a specified AFTN addressee. The IUT retransmits the respective AFTN message via its AFTN/AMHS interface (*R4*).

For certain out-of-line situations, which may occur during conversions in the AFTN/AMHS Gateway, the AMHS SARPs [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test exercises at the reference point *R7* in Figure 9.

4.3.4.2 User message from AFTN to AMHS

Figure 10 depicts the test configuration for verification of the Gateway operations for the flow of a user message from AFTN to AMHS. The test configuration follows from Figure 4 and Figure 5.

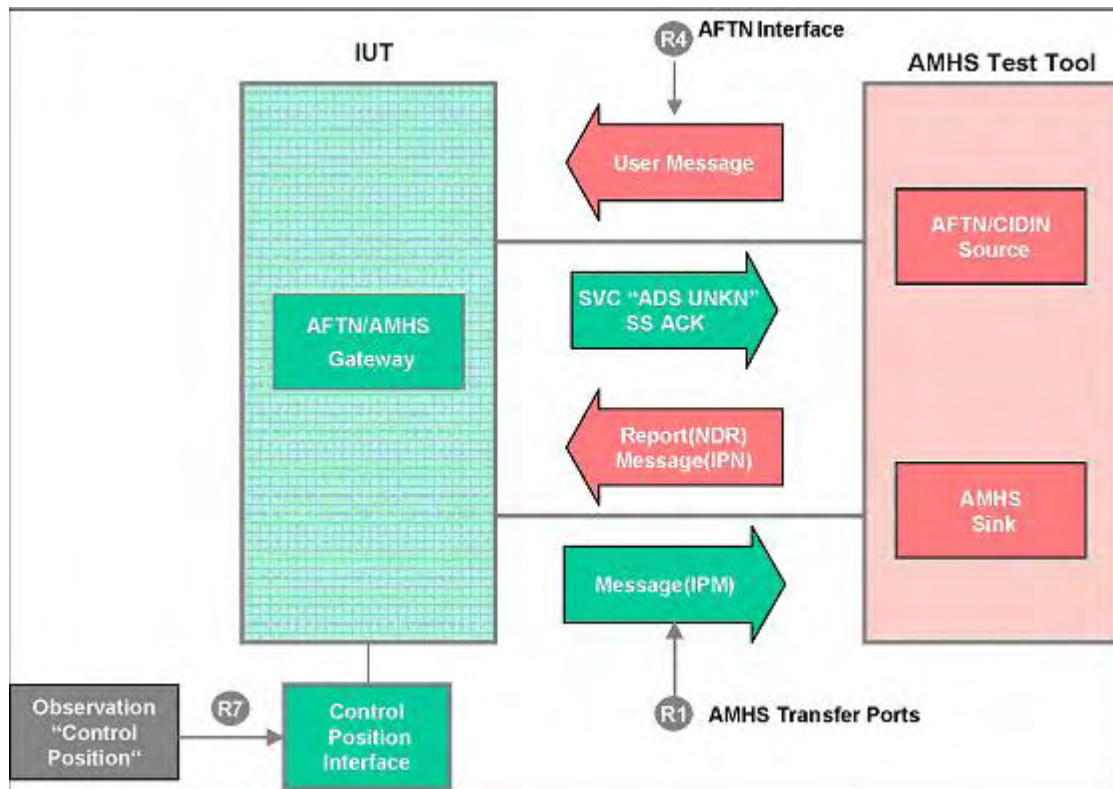


Figure 39: Test configuration “Gateway” – User message from AFTN to AMHS

The following actions may be performed with the Gateway test configuration depicted in Figure 10:

- The AMHS Test Tool provides the IUT at its AFTN/X.25 interface (reference point *R4* in Figure 10) with valid and invalid AFTN user messages. The IUT converts valid AFTN user messages in AMHS messages containing IPMs which leave the IUT at its transfer ports (*R1*), invalid AFTN user messages are handled according to locally implemented procedures. When the conversion of AFTN addressee indicators fails, the IUT returns AFTN service messages of the type SVC “ADS UNKNOWN” to the AFTN (AMHS Test Tool) via its AFTN/X.25 interface (*R4*).
- The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with a Non-Delivery Report (NDR) simulating the detection of an unknown recipient address within the AMHS. The IUT converts the NDR in an AFTN service message of the type SVC “ADS UNKNOWN” which leaves the IUT via its AFTN/X.25 interface (*R4*).

The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with an AMHS message containing a Receipt Notification (RN) indicating the reception of a SS-priority message at a specified AMHS recipient. The IUT converts the RN in a SS ACK which leaves the IUT via its AFTN/X.25 interface (*R4*).

For certain out-of-line situations which may occur during conversions in the AFTN/AMHS Gateway, the AMHS SARPs [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test exercises at the reference point *R7* in Figure 10.

4.3.4.3 Handling of Probes

Figure 11 depicts the test configuration for verification of the Gateway operations when receiving a Probe. The test configuration follows from Figure 4 and Figure 5.

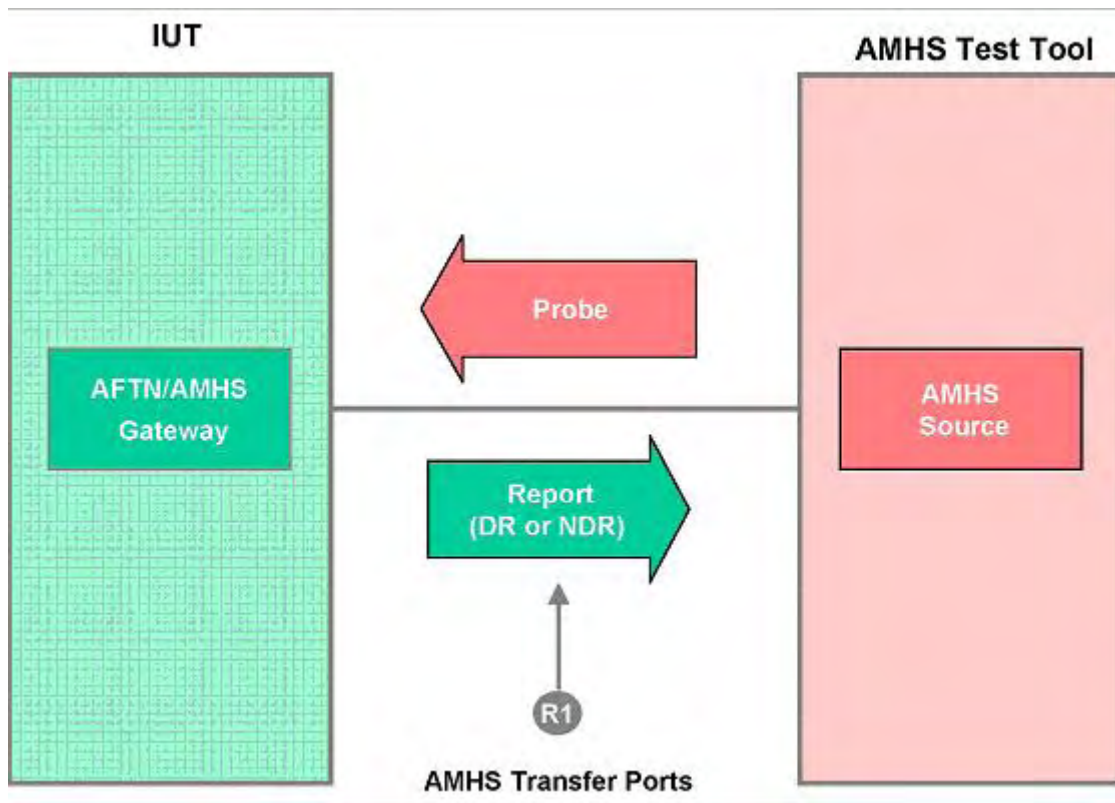


Figure 40: Test configuration “Gateway” – Handling of Probes

The following actions may be performed with the Gateway test configuration depicted in Figure 11:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 11) with valid and invalid Probes.

The IUT verifies whether it could have effected translation in an AFTN user message by comparing certain parameters in the Probe with the capability of its gateway function. The IUT generates in dependence on the result of the verification either a Delivery Report (DR) or a Non-Delivery Report (NDR) which is returned to the AMHS Test Tool via a transfer port (*R1*).

4.3.5 Naming and addressing

Naming and addressing in the AMHS context relates to the unambiguously identification of 1) users to a global AMHS and 2) communication entities residing in the upper layers of the AMHS communication stack. Focus of conformance testing is the IUT's capability to handle AMHS addressing schemes for identification of users. The second aspect is covered by setting up of configuration parameters in the test configuration (see Section 5).

The AMHS SARPs specify two user addressing schemes which are collectively referred to as MF-addressing schemes: the *XF-addressing scheme* and the *Common AMHS Addressing Scheme (CAAS)*. Preference should be given to the latter. In addition, the SARPs allow to implement within an AMHS Management Domain *locally defined* schemes. The AMHS Test Tool supports the XF-addressing scheme and the CAAS. (Support of other addressing schemes may be subject of further extensions.)

The use of *directory names* is seen as a local matter when supporting the *Basic ATS Message Handling Service* (AMHS SARPs). Their support by the AMHS Test Tool may be subject of further extensions meeting the requirements of the *Extended ATS Message Handling Service*.

An IUT's capability to handle MF-addressing schemes is already implicitly verified with the operations related test groups as defined in Sections 4.3.1 to 4.3.4. However, for in-depth testing of implemented addressing features the establishment of a dedicated test group may be a suitable approach. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10.

Note. – The aspect of a dedicated test groups for in-depth testing of system level provisions applies also to the two remaining test groups defined below.

4.3.6 AMHS parameters

The AMHS SARPs [1] 3.1.2.2.3 specify a number of operational conventions which have the nature of parameters from the MHS point of view. These parameters relate to:

- Use of MF-addresses (see Section 4.3.5)
- User data conventions
 - Only single body part in IPMs
 - Ia-5 text body (Basic ATS Message Handling Service)
- Use of ATS-Message-Header in the body part of IPMs (Basic ATS Message Handling Service)
- Restriction of Notification Requests (IPMS) for SS-priority messages. In-depth testing of the AMHS parameters may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10.

4.3.7 Traffic logging

The AMHS SARPs specify long-term (30 days) logging requirements for the various types of functional components of the AMHS. The requirements make it possible to perform message tracing through the AMHS, in particular when an investigation is needed. The query of the logged information is seen as a local implementation detail.

Logging requirements are placed on the following functional components of the AMHS:

- ATS Message User Agent
- ATS Message Server
- AFTN/AMHS Gateway concerning its sub-components
 - ATN component – [1] Section 3.1.2.3.2.2.6
 - Message Transfer and Control Unit (MTCU) – [1] Section 3.1.2.3.3.1
 - AFTN component – [1] Section 3.1.2.3.21.8-11.

In-depth testing of the traffic logging may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from them depicted in Figure 6 to Figure 10. Verification of the logged information will make use of the local query and tracing provisions. Access is typically provided at the system management interface of the IUT (cf. reference point *R8* in Figure 5).

4.4 Definition of test cases

According to ISO 9646-2 a *test case* comprises the actions to achieve a specific test purpose. Each test case normally has a single test purpose, such as that of verifying that the IUT has a certain required capability (e.g. the capability to support certain message lengths) or exhibits a certain required behaviour when a particular event occurs (e.g. transfer of submitted messages). Typically, a set of test cases aiming at a common functional area of an IUT are arranged to a *test group* (see Section 4.3).

There may be many criteria for methodical definitions of test cases (within a test group) to achieve an envisaged confidence in a particular functional area of the IUT. Figure 12 depicts proposed two levels of high-order criteria for definitions of AMHS related test cases. The AMHS Test Tool should support conformance testing in a scope as outlined in Figure 12.

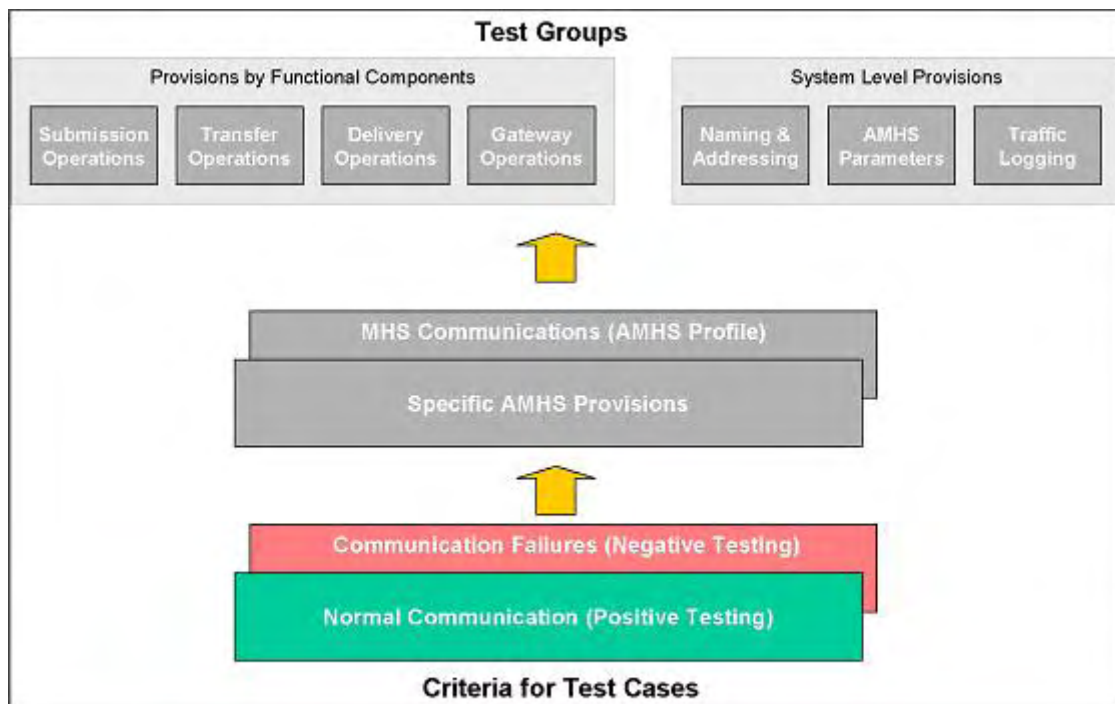


Figure 41: Approach for definition of Test Cases

In Figure 12 a distinction is made between communication requirements which are of general nature in MHS environments and such which are specific to AMHS. The first category of requirements is addressed in the AMHS SARPs just by references to the MHS standard (ISO/IEC 10021) and related profile documentation (ISPs). No further details of MHS procedures are provided with the AMHS SARPs.

In addition, the AMHS SARPs include a number of provisions which are specific for AMHS. Such provisions may relate to supplementary functional components (as AMHS gateways) or specify conventions for which MHS implementations are transparent (e.g. limited use of notification requests). The AMHS SARPs specify the AMHS specific provisions in a “standalone” manner.

Note. – An example of the above made distinction between specific AMHS requirements and underlying MHS features are the AMHS traffic logging requirements: The traffic logging requirements at an ATS Message Server refer to the last element of the trace-information (AMHS SARPs). The trace-information itself (forming part of the message-transfer-envelope) is specified in ISO/IEC 10021-4, 12.3.1. – It is up to the organisation which will operate an AMHS system to limit conformance testing to the SARPs specific elements or to extend testing to the referenced trace-information as defined with the MHS standard.

As second level criteria for definition of test cases a distinction is made between normal MHS/AMHS communications (*positive testing*) and enforcing fault situations (*negative testing*). Figure 13 details this further logical ordering of testing.

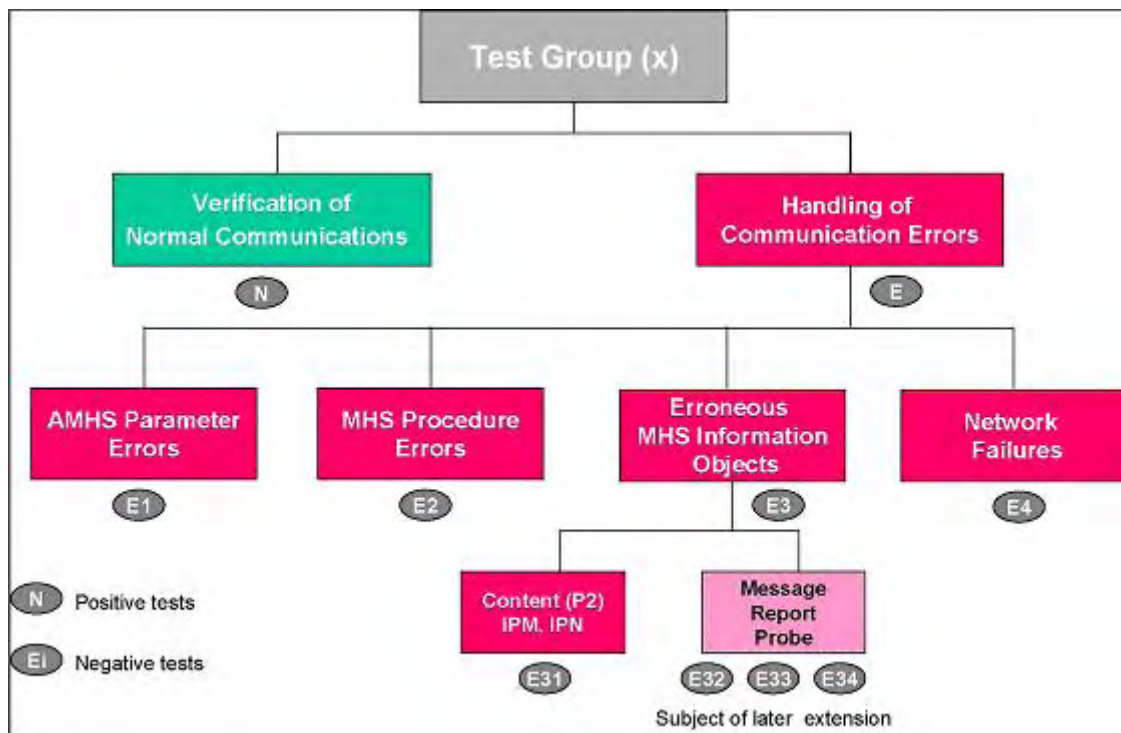


Figure 42: Classes of “Negative Tests”

The test categories indicated in Figure 13 are based on the following definitions:

Normal communications (N). – The AMHS Test Tool provides the IUT with correct inputs and the related responses (behaviour) of the IUT should be in compliance with the AMHS SARPs. It should be noted that a correct response of the IUT not always equals to a successful transmission of an AMHS information object. Example: If the service element *DL-expansion-prohibited* has been set then a DL expansion will not occur.

Erroneous AMHS parameters (E1). – The AMHS SARPs, Parameters, specify a number of specific AMHS conventions as use of MF-addresses, ATS-Message-Header, notification requests and single body part IPMs. It should be noted that violations of such AMHS conventions are not equal with faults in the MHS communication.

MHS procedural errors (E2). – The AMHS Test Tool does not act in compliance with the MHS procedures or the arrangements made in the test configuration. Examples:

- 1) The IUT is requested to send a message with a Report request, however, the AMHS Test Tool does not return any Report.
- 2) 2) The AMHS Test Tool uses a recipient address which is unknown in the test configuration.

Erroneous MHS information objects (E3). – That means arguments have not allowed values or information objects are corrupted. A distinction is made between the levels of IPMS and MTS:

- IPMS (E31). – IPMs and IPNs sent to the IUT are not correctly encoded (syntax or semantic errors). Example: Mandatory arguments in the IPM heading are missing or there is no IPM body attached to the IPM heading.
- MTS (E32), (E33), (E34). – Messages, Reports and Probes sent to the IUT are not correctly encoded. Example: In a Report the *Report Transfer Content* is missing.

Network failures (E4). – Transient interruptions of network connections during transmission of AMHS information objects. The AMHS Test Tool supports negative testing of the categories E1, E2 and E31 and E4 (Figure 13).

Note. – Negative testing of the categories E32, E33 and E34 may be subject of further extensions of the testing requirements if experience leads to this need.

A given test group may be transparent for one or more classes of “negative tests”. For example, transfer operations are transparent for AMHS parameter errors (E1) and Content (IPMS) failures (E31). Table 3 indicates in a form of a matrix the valid interrelations between defined test groups and classes of negative tests. Such a testing matrix may be helpful to demonstrate the reached coverage of testing for a given set of test cases.

	Submission Ops	Transfer Ops	Delivery Ops	Gateway Ops	Naming & Addressing	AMHS Parameters	Traffic Logging
N	X	X	X	X	X	X	X
E1	X	n/a	X	X	X	X	n/a
E2	X	X	X	X	n/a	n/a	n/a
E31	X	n/a	X	X	n/a	n/a	n/a
E32 – E34	X	X	X	X	n/a	n/a	n/a
E4	X	X	X	X	n/a	n/a	n/a

X = valid interrelation; n/a = not applicable

Table 33: Applicability of negative testing for test groups (testing matrix)

5 Configuration Parameters

The generic test configuration depicted in Figure 5 needs a number of quantitative adjustments before AMHS Test Tool and IUT are in a position to communicate with each other. The subjects of such adjustments are the values of *configuration parameters* which are inherent in the test configuration. Configuration parameters relate to the number of established communication links, number of simulated AMHS and AFTN users as well as to addresses associated with the various layers of communications. Below the configuration parameters are specified in the categories of AMHS and X.25/AFTN communications.

5.1 AMHS communication

5.1.1 AMHS application

- Number of transfer ports: 3
- Number of AMHS users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

5.2 Layer Addresses

No.	Address Type	AMHS SARPs	Value	
			IUT	AMHS Test Tool
1	Application Process Title	3.1.2.1.5.2.1 4.3.2.2		
2	AE-Qualifier	3.1.2.1.5.2.2	ATS Message Server: AMS(7) AFTN/AMHS Gateway: GWB(8)	
3	Presentation Selector	3.1.2.1.5.2.3	tbd	tbd
4	Session Selector	3.1.2.1.5.2.3	tbd	tbd
5	TSAP	3.1.2.1.5.2.3	tbd	tbd
6	TCP Port	n/a	102	
7	IP Address	n/a	tbd	MTA(1): tbd MTA(2): tbd

No.	Address Type	AMHS SARPs	Value	
			IUT	AMHS Test Tool
				MTA(3): tbd
8	MAC Address	n/a	tbd	MTA(1): tbd MTA(2): tbd MTA(3): tbd

Reference: Sections 3.3 and 3.5.1.1.

Table 34: Layer addresses (AMHS communications)

5.3 AFTN/X.25 communication

5.3.1 AFTN application

- Number of links: 1
- Number of AFTN users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

5.4 Layer addresses

No.	Address Type	Reference	Value	
			IUT	AMHS Test Tool
1	X.25 Entry (Ae)	[3] 6.1.2.1.4.5	<i>tbd</i>	<i>tbd</i>
	X.25 Exit (Ax)	[3] 5.1.2.7	<i>tbd</i>	<i>tbd</i>
2	X.25 DTE	[3] 4.2.1.7	<i>tbd</i>	<i>tbd</i>

Reference: Sections 3.4 and 3.5.1.2

Table 35: Layer addresses (X.25 communications)

5.5 Test Data

The test data generated and evaluated in conformance testing environments with the AMHS Test Tool comprise (cf. Figure 5):

- (1) AMHS and AFTN information objects exchanged between the AMHS Test Tool and IUT. These information objects are well defined by the AMHS SARPs and Annex 10, Vol. II [2], respectively.
- (2) AMHS information objects entered and presented at AMHS user interfaces of the IUT. Even if these information objects are substantially specified by the AMHS SARPs their appearance at AMHS user interfaces is specific to a given IUT. In addition, when entering AMHS information objects certain parameters may be handled by the IUT as defaults and do not appear at user interfaces at all.
- (3) The AMHS SARPs specify events to be reported to the Control Position of an AFTN/AMHS Gateway. However, the style of reporting is an implementation matter.
- (4) Traffic log data to be maintained by the IUT are specified in the AMHS SARPs, however, their handling and presentation is specific for each IUT.

Note:

The correct interpretation of test data of the types (2) to (4) needs insight into the IUT's User Manual.

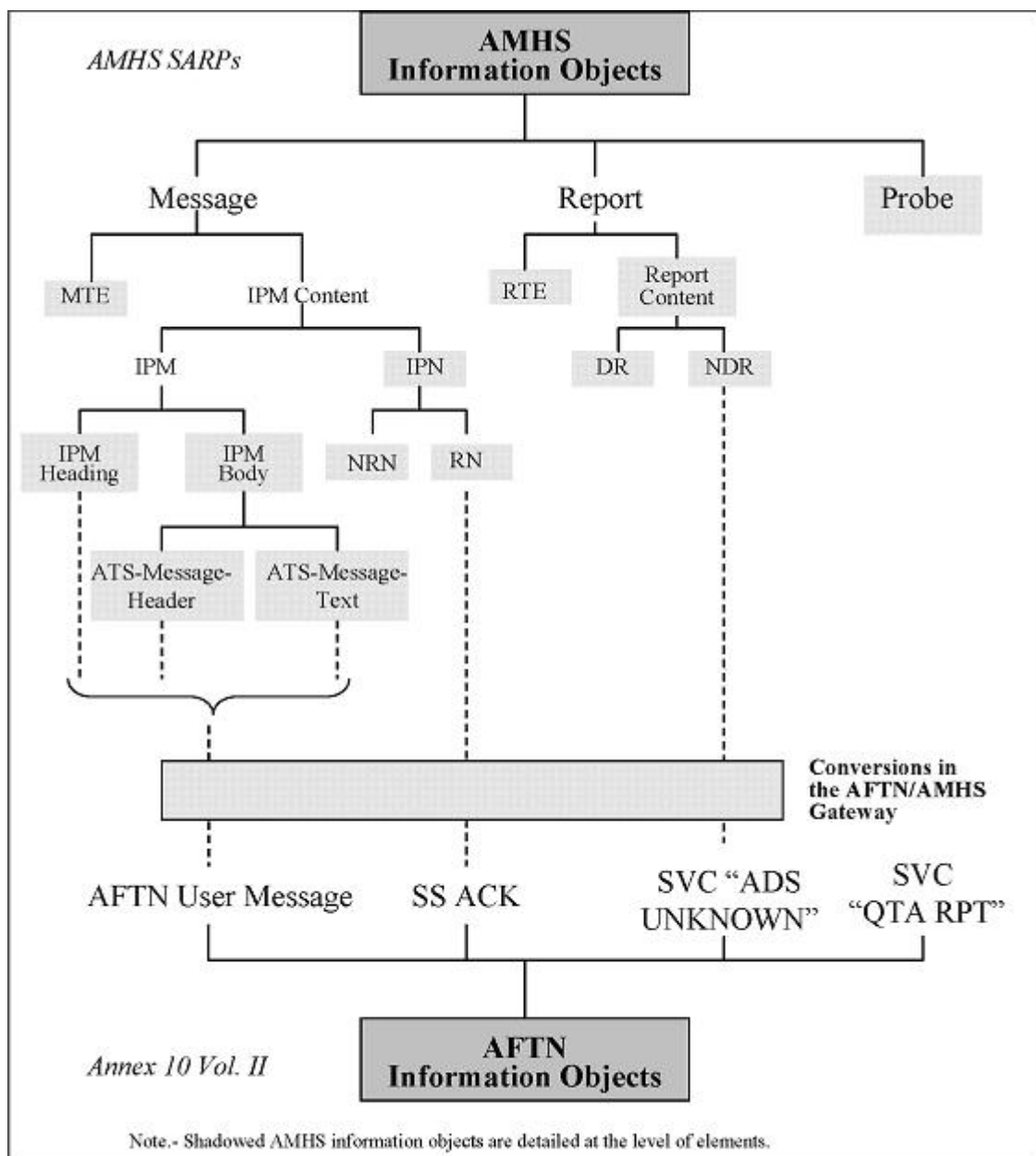


Figure 43 : Information objects supported by the AMHS Test Tool

6 Recommended default values for international MTA names and passwords

6.1 Introduction

6.1.1 AMHS implementation requires the setting of the MTA names and passwords for each communication partner (MTA) connected. In a future fully meshed AMHS Network, unique identification of the MTAs would be required. Additionally, the naming should respect the knowledge and experiences of the operator staff, in order to avoid any unnecessary complications in the transition to AMHS.

6.1.2 One way to achieve this is to use a scheme, in which MTA names and passwords contain keywords which uniquely identify the MTA and facilitate recognition.

6.2 Default values for international MTA names

6.2.1 The recommended scheme of MTA names consists of:

- the term “MTA”
- the Location Indicator of the MTA location and
- a number (for future extensions if required)

6.2.2. All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

Example: In accordance with this scheme the name of the MTA in Singapore, should be: MTA-WSSS -1.

6.2.3 This scheme could be used for the national MTA naming as well.

6.3 Default values for international MTA passwords

6.3.1 Password complications arise because manufacturers deviate in the interpretation of an “empty” password. Some implementations await “nothing”, some hexadecimal 00, others a single “space” character. To avoid misinterpretations during establishment of association(s) all tests could be performed with a common (known) password. Individual secure passwords could be established later, in order to ensure the necessary security of operational AMHS facilities.

6.3.2 The recommended scheme of the default password consists of:

- the term “ICAO”
- the Location Indicator of the MTA location and
- the specific number of the MTA

6.3.3 All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

Example: In accordance with this scheme the default password of the MTA in Singapore should be: ICAO-WSSS-1.

6.3.4 By following this scheme, the default passwords of future MTAs can be determined at any time. If there are no other security requirements such a scheme can simplify the integration of new MTAs in a fully meshed AMHS Network topology.

- END -

ANNEX E

AMHS Inter-Operability Tests

ANNEX E

of

AMHS Manual

Document Control Log

[illegible]

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- [4] ASIAPAC AMHS Manual, Annex D, AMHS Testing Requirements

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1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define the functional tests for AMHS Interoperability in order to ensure the end-to-end interoperability between AMHS systems under test. These tests are performed after the successful completion of AMHS conformance testing, through which the compliance of all systems under test to the AMHS SARPs has been demonstrated.

For this reason the data used in the interoperability tests are generated either:

- manually; or,
- using records obtained by copy (duplication) and storage of some real traffic occurred among users in service; or
- using parallel duplicated traffic.

Implementations tested in this phase will not be operational systems, but test beds in order to neither disturb the real traffic nor cause potential outages in the operational systems.

As a summary, the correct performance of the interoperability tests included in this document is the previous step to progress the IUT towards a future operational system; this will be done by means of a transition plan to real traffic in the future operational environment.

1.2 Document Structure

Chapter 2 presents the test environment used for AMHS interoperability testing.

Chapter 3 defines the addressing plan implemented in the test environment.

Chapters 4 and 5 contain the general description of the bilateral and trilateral test procedures with subsections for each AMHS functional area. Each test procedure is presented in a structured way consisting of

- defined test criteria,
- a (brief) scenario description,
- reference to the relevant part of the standard specification (SARPs section),

Chapters 6 and 7 contain the detailed test-case descriptions for the bilateral and trilateral test procedures.

Chapter 8 contains the templates for the test messages.

1.3 Test Identification Scheme

Each Interoperability Test procedure has an identifier in the form

ITxnn where:

IT is an acronym for Interoperability Test, *x* is a number identifying the test group¹ and *nn* is a consecutive number identifying the individual test procedure.

Test procedures are classified in two blocks: Bilateral Tests and Trilateral Tests.

The bilateral test groups consist of tests using messages specifically generated by IUTs for trials. The following six groups have been identified:

- testing of submission, transfer and delivery operations (*x* = 1),

- testing of gateway operations converting a user message from AFTN to AMHS (x=2),
- testing of gateway operations converting a user message from AMHS to AFTN (x=3),
- testing of gateway operations converting a user message from AFTN to AMHS and back to AFTN (x=4),
- testing of gateway operations – special cases (x=5) and
- testing of stress traffic situations (x=6)

The two trilateral test groups are:

- testing of transfer (relay) operations (x=7),
- testing of special situations (alternate routing, traffic loop) (x=8).¹

¹ Test groups for AMHS conformance tests have been identified in [4].

2 AMHS Interoperability Test Environment

2.1 Application infrastructure

Both AMHS Implementations Under Test (IUTs) are complete systems constituted by AFTN, AMHS and AFTN/AMHS gateway components, with corresponding AFTN and AMHS user terminals and supervision positions, as decided locally by the corresponding organization.

In each IUT, an AMHS User Agent is used in submission and delivery tests. Gateway tests involve an AFTN user terminal. The use of the Monitor & Control Position is required in order to observe the outcome of the conversion processes, especially in out-of-line situations.

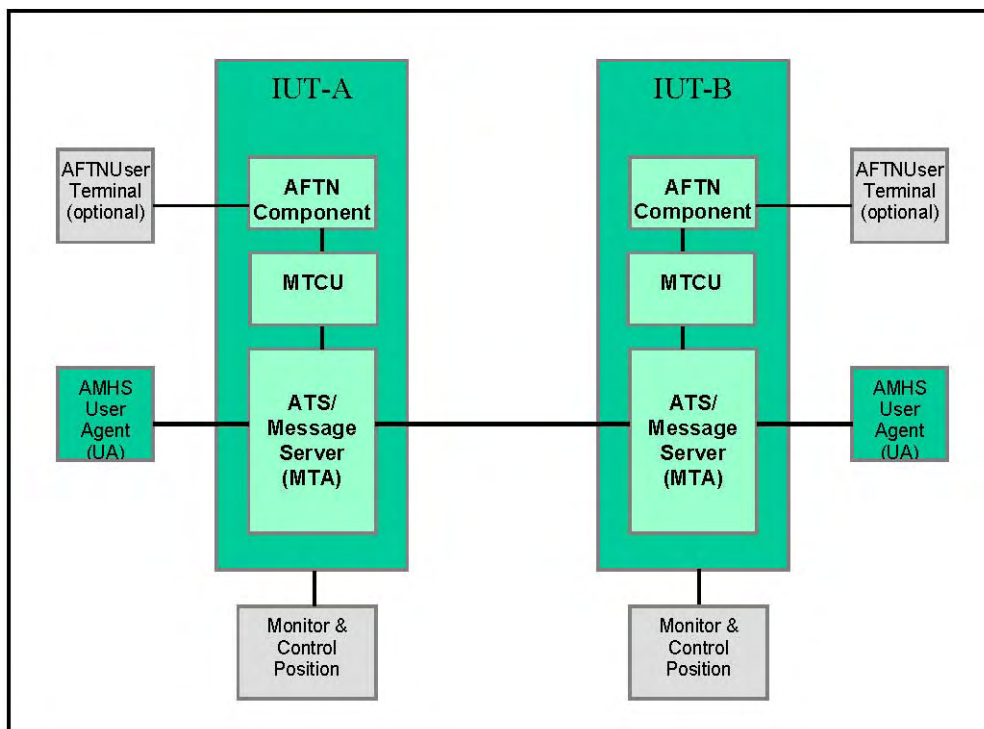


Figure E- 1: AMHS Inter-operability Test Environment

Figure E-1 shows the test environment used for AMHS interoperability tests. Both IUTs will be interconnected via AMHS transfer ports supporting the X.400/P1 protocol over a TCP/IP/LAN.

Note. – In Figure E-1 the AFTN Terminal is directly connected to the AFTN Component in an abstract way. There may exist different implementations with an AFTN component only connected to an AFTN switch or integrated AFTN/AMHS switches. For the interoperability tests it does not matter whether the AFTN Terminal is connected directly or indirectly.

The components of the test environment as depicted in Figure 1 are involved in the test procedures in following way:

Submission, Transfer and Delivery operation tests (AMHS => AMHS) (x=1):

AMHS User Agent => ATS Message Server => ATS Message Server => AMHS User Agent

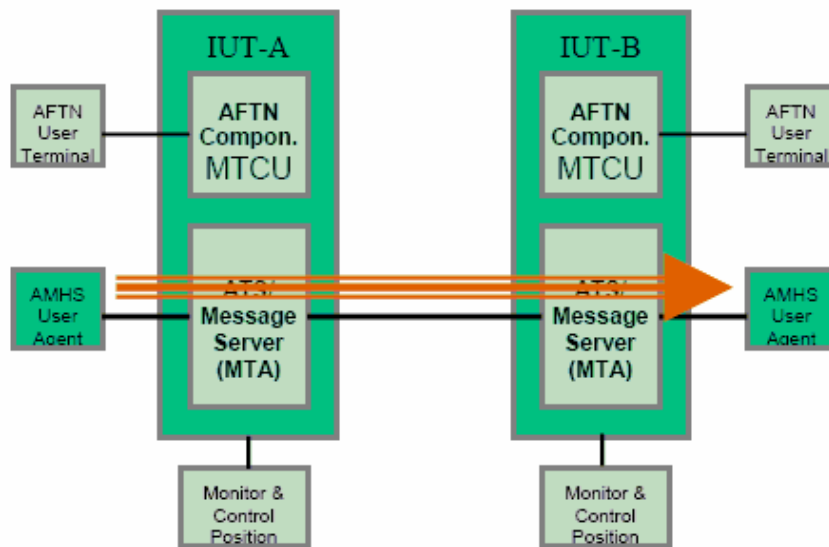


Figure E- 2: UA to UA (IUT-A to IUT-B)

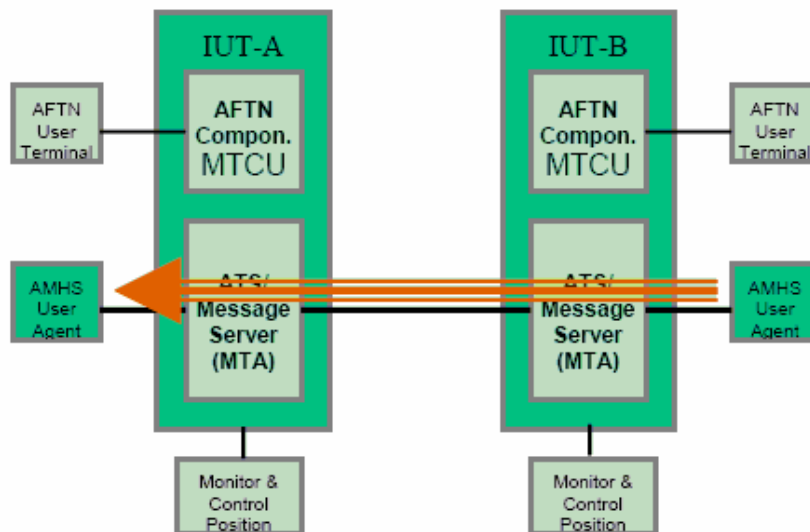


Figure E- 3: UA to UA (IUT-B to IUT-A)

AMHS / AFTN gateway tests (AFTN => AMHS) (x=2):

AFTN Terminal => Gateway and ATS Message Server => UA

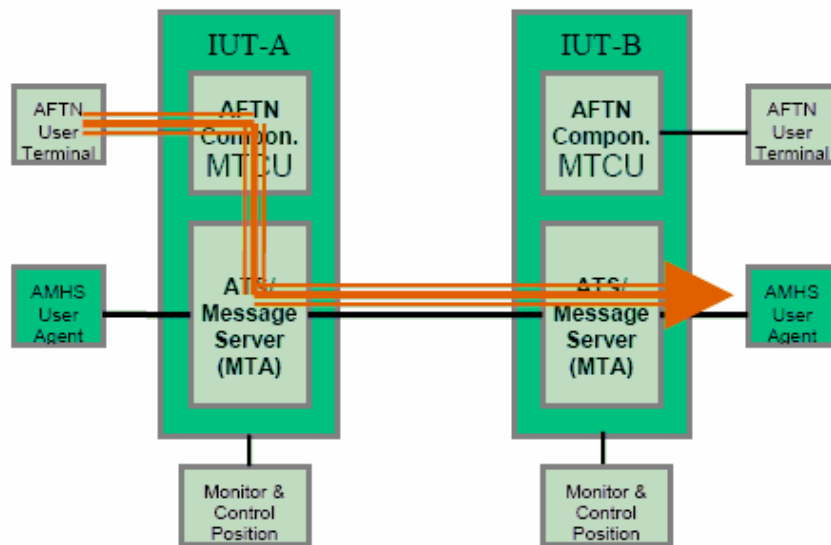


Figure E- 4: AFTN Terminal to UA (IUT-A to IUT-B)

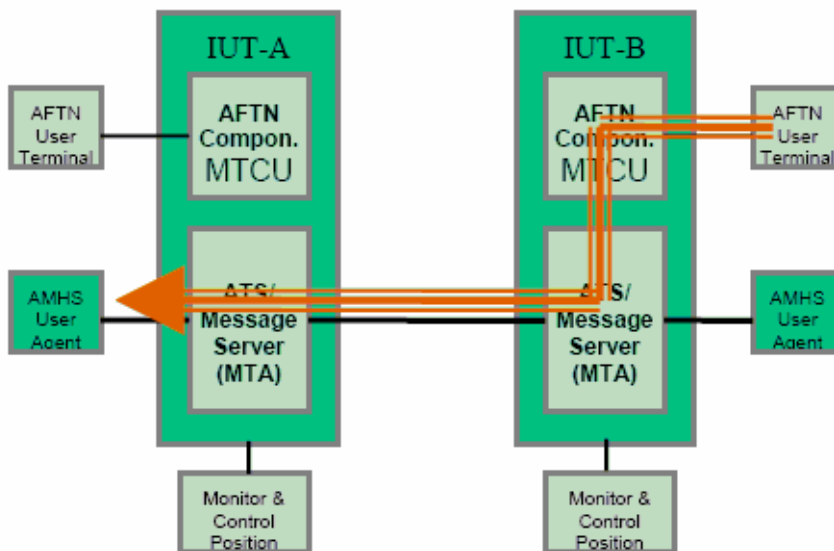


Figure E- 5: AFTN Terminal to UA (IUT-B to IUT-A)

AMHS / AFTN gateway tests (AMHS => AFTN) (x=3):

UA => ATS Message Server and Gateway => AFTN Terminal

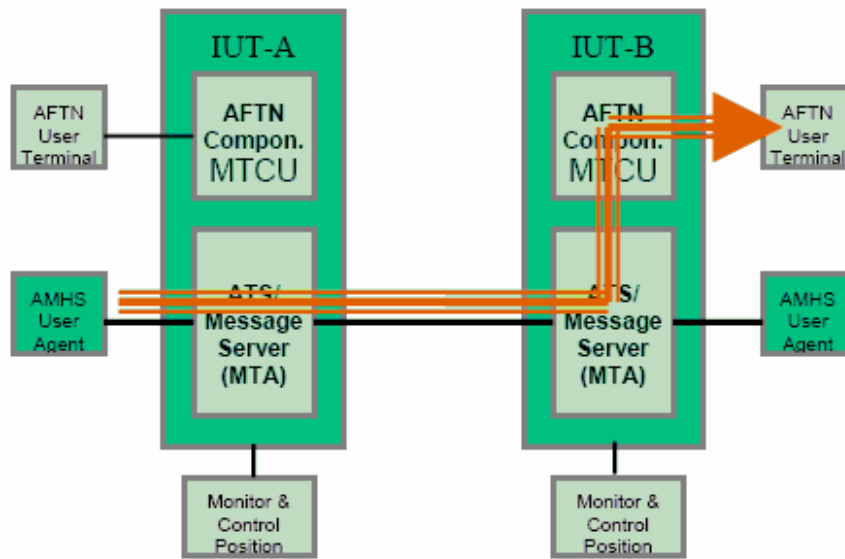


Figure E- 6: UA to AFTN Terminal (IUT-A to IUT-B)

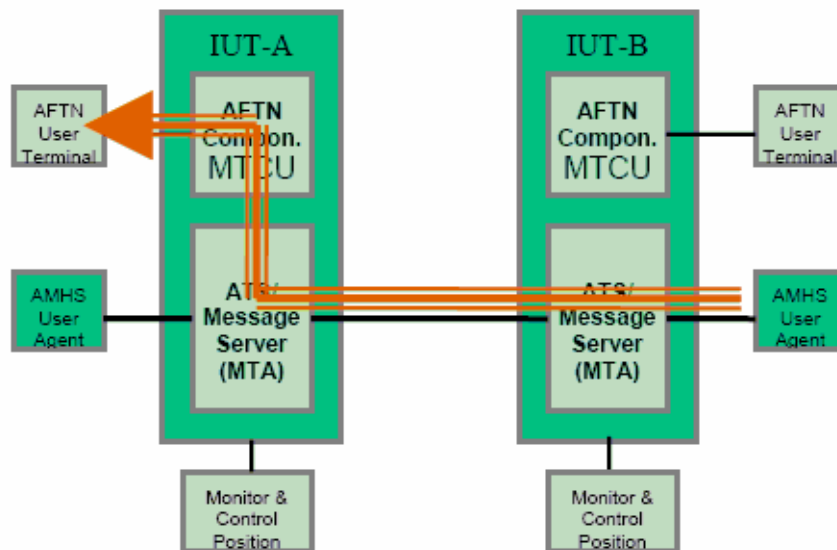


Figure E- 7: UA to AFTN Terminal (IUT-B to IUT-A)

AMHS / AFTN gateway tests (AFTN => AMHS => AFTN) (x=4):

AFTN Terminal => Gateway => ATS Message Servers => Gateway => AFTN Terminal

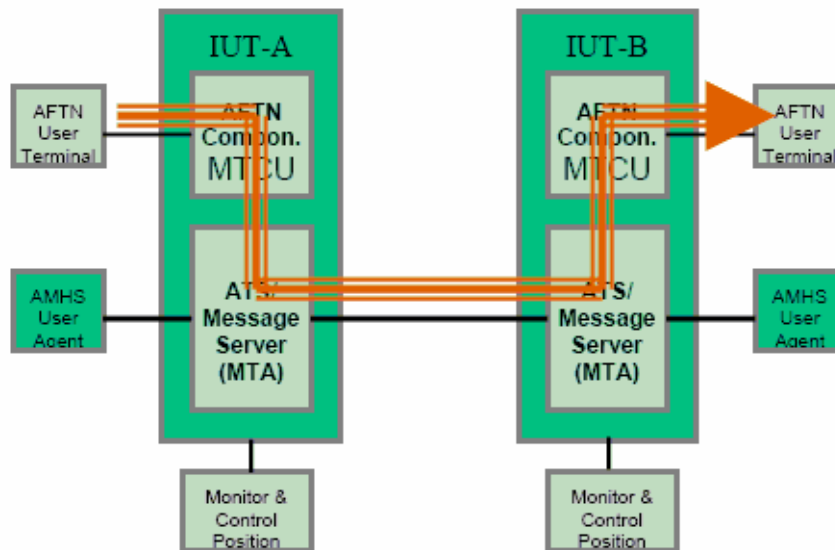


Figure E- 8: AFTN Terminal to AFTN Terminal (IUT-A to IUT-B)

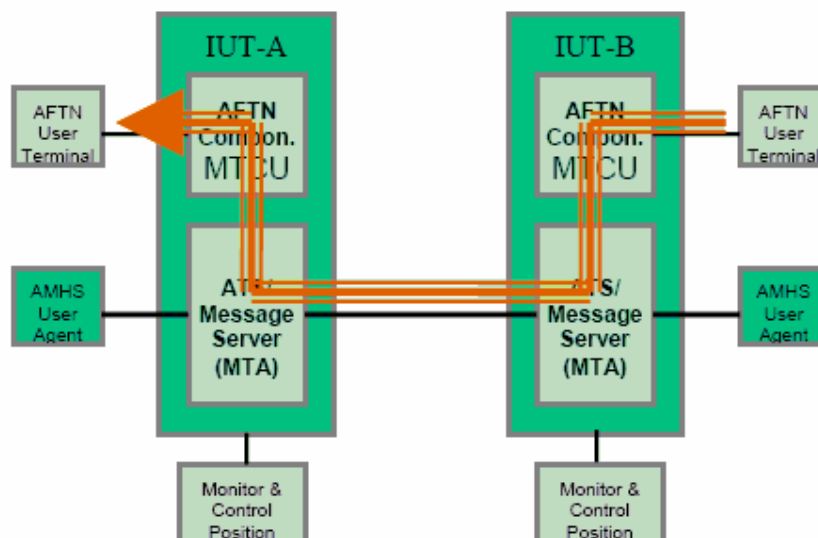


Figure E- 9: AFTN Terminal to AFTN Terminal (IUT-B to IUT-A)

Gateway Operations – special case scenarios (x=5)

For the special case scenarios different combinations of the flows shown above are used.

Stress traffic situations (x=6)

Depending on the stress scenario chosen combinations of the flows shown above are used.

“Relay” operation tests (x=7) – (optional - additional test partner required – IUT-C)

Peer IUT => IUT (ATS Message Server) => peer IUT

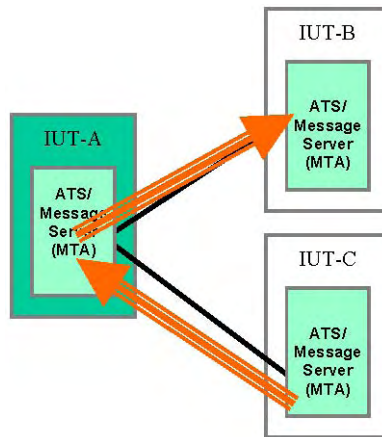


Figure E- 10: “Relay” operation tests

Testing of special situations (x=8) – (optional - additional test partner required – IUT-C and – additional connectivity required IUT-B - IUT-C)

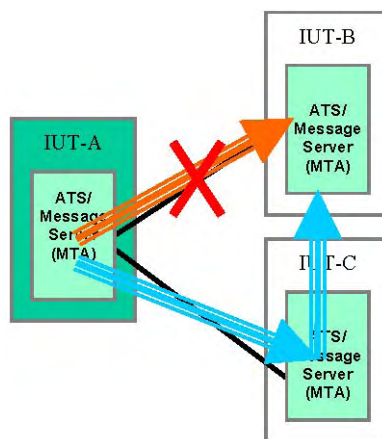


Figure E- 11: Alternate MTA routing

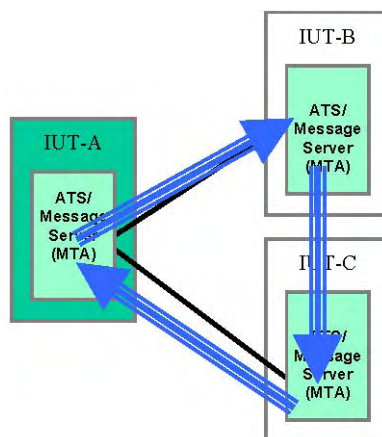


Figure E- 12: Traffic loop test

2.2 Transport infrastructure

To perform the bilateral interoperability tests, an underlying infrastructure for message transport between the two IUTs has to be agreed. In case of multilateral tests an underlying infrastructure for message transport between the involved IUTs (minimum three) has to be agreed. Other “non-standard” solutions may be used for testing. Those refer to the actual network environment or other means offered by communications suppliers, such as ADSL, public internet; in this case, agreement among the parties is necessary due to the potential impact of this solution on the configuration of the timers of the systems concerned, as compared to the standard solution.

2.3 General parameters to be agreed

The following entries and/or parameter shall be agreed between the test partners. Preferred the default values should be used.

2.3.1 Default MTA names and passwords

IUT	MTA name	Remarks
IUT-A	MTA-IUTA-1	
IUT-B	MTA-IUTB-1	
IUT-C	MTA-IUTC-1	

Table 36: Default MTA names

IUT	password	Remarks
IUT-A	ICAO-IUTA-1	
IUT-B	ICAO-IUTB-1	
IUT-C	ICAO-IUTC-1	

Table 37: Default passwords

2.3.2 TSAP addresses

IUT	TSAP address	Remarks
IUT-A	to be agreed bilaterally	
IUT-B	to be agreed bilaterally	
IUT-C	to be agreed	

Table 38: TSAP addresses

2.3.3 IP addresses

IUT	IP address	Remarks
IUT-A	to be agreed bilaterally	
IUT-B	to be agreed bilaterally	
IUT-C	to be agreed	

Table 39: IP addresses

2.3.4 Type and number of associations

IUT	Type of associations	Number of associations	Remarks
IUT-A	monologue	5	
IUT-B	monologue	5	
IUT-C	monologue	5	

Table 40: Default type and number of associations

3 Addressing Plan for AMHS Interoperability Testing

3.1 User addresses

To meet the scope of testing, the test-address space used by AMHS Interoperability Testing should include, for each IUT, the respective AFTN and AMHS addresses and the corresponding AMHS PRMD.

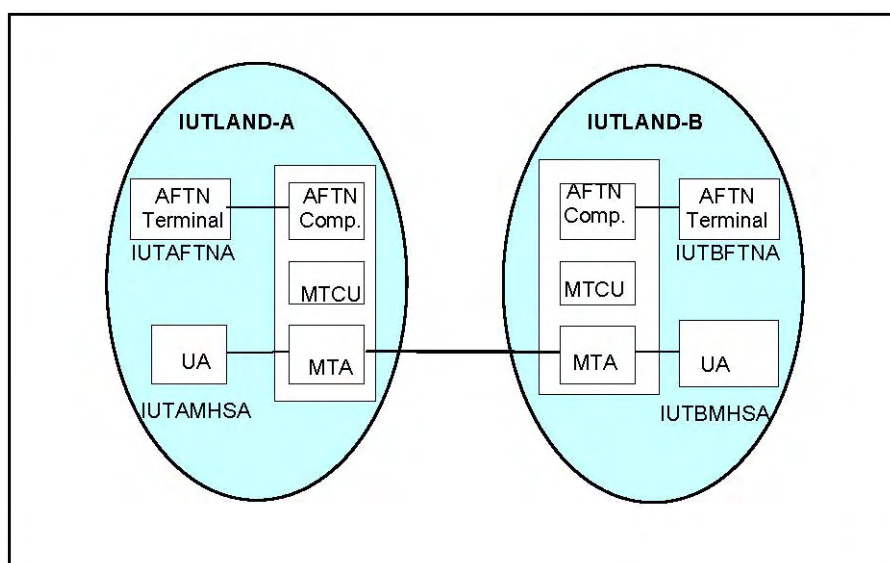


Figure E- 13: Addressing Plan

The original, operational AMHS and AFTN addresses assigned to the COM Centre could be used as test addresses for each IUT. To distinguish between operational and test addresses it is recommended to use alternatively, a generic address space taken from fictitious PRMD/AFTN countries IUTLAND-A and IUTLAND-B.

This includes generic user addresses IUTAFTNA and IUTAMHSA for IUTLAND-A as well as IUTBFTNA and IUTBMHSA for IUTLAND-B, which may be mapped either according to the CAAS (preferred, or a more comprehensive set of addresses in case of CAAS with multiple "O" values) or the XF addressing scheme.

The following tables show the generic address space assigned to the two IUTs and a third IUT if trilateral network tests are performed.

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION OU1 = IUTA CN = IUTAFTNA ... IUTAMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION1 OU1 = IUTA CN = IUTAFTNA ... IUTAMHSA O = A-REGION2 OU1 = IUAA CN = IUAAFTNA ... IUAAMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-A O = AFTN OU1 = IUTAFTNA ... IUTAMHSA

Table 41: Generic address spaces of IUTLAND-A

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-B O = B-REGION OU1 = IUTB CN = IUTBFTNA ... IUTBMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-B O = B-REGION1 OU1 = IUTB CN = IUTBFTNA ... IUTBMHSA O = B-REGION2 OU1 = IUBB CN = IUBBFTNA ... IUBBMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-B O = AFTN OU1 = IUTBFTNA ... IUTBMHSA

Table 42: Generic address spaces of IUTLAND-B

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-C O = C-REGION OU1 = IUTC CN = IUTCFTNA ... IUTCMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-C O = B-REGION1 OU1 = IUTC CN = IUTCFTNA ... IUTCMHSA O = B-REGION2 OU1 = IUCC CN = IUCCFTNA ... IUCCMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-C O = AFTN OU1 = IUTCFTNA ... IUTCMHSA

Table 43: Generic address spaces of IUTLAND-C

3.2 DL addresses

Distribution List name	Addresses included in the DL	Remarks
IUTADLLO	IUTBFTNA IUTBFTNB IUTBMHSA	
IUTADLRE	IUTAFTNA IUTAFTNB IUTAMHSA	

Table 44: DL addresses of IUT-A

Distribution List name	Addresses included in the DL	Remarks
IUTBDLLO	IUTAFTNA IUTAFTNB IUTAMHSA	
IUTBDLRE	IUTBFTNA IUTBFTNB IUTBMHSA	

Table 45: DL addresses of IUT-B

3.3 AFTN and X.400 Routing Tables

3.3.1 AFTN and X.400 Routing Tables of IUT-A

AFTN Routing Indicator	Routing direction	Remarks
IUTAFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 46: AFTN Routing Table of IUT-A X.400

Routing Indicator X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSA/	UA IUT-A	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSB/	UA IUT-A	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSC/	UA IUT-A	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSA/	UA IUT-A	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSB/	UA IUT-A	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSC/	UA IUT-A	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-A	MTCU	
/C=XX/A=ICAO/P=IUTLAND-B	MTA-IUTB-1	
/C=XX/A=ICAO/P=IUTLAND-C	MTA-IUTC-1	
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTB-1	

Table 47: X.400 Routing Table of IUT-A

3.3.2 AFTN and X.400 Routing Tables of IUT-B

AFTN Routing Indicator	Routing direction	Remarks
IUTBFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 48: AFTN Routing Table of IUT-B

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSA/	UA IUT-B	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSB/	UA IUT-B	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSC/	UA IUT-B	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSA/	UA IUT-B	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSB/	UA IUT-B	If “XF” type

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSC/	UA IUT-B	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-B	MTCU	
/C=XX/A=ICAO/P=IUTLAND-A	MTA-IUTA-1	
/C=XX/A=ICAO/P=IUTLAND-C	MTA-IUTC-1	
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTC-1	

Table 49: X.400 Routing Table of IUT-B

3.3.3 AFTN and X.400 Routing Tables of IUT-C

AFTN Routing Indicator	Routing direction	Remarks
IUTCFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 50: AFTN Routing Table of IUT-C

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSA/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSB/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSC/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSA/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSB/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSC/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C	MTCU	
/C=XX/A=ICAO/P=IUTLAND-A	MTA-IUTA-1	
/C=XX/A=ICAO/P=IUTLAND-B	MTA-IUTB-1	
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTA-1	

Table 51: X.400 Routing Table of IUT-C

3.4 Look-up Table

3.4.1 Generic look-up Table for all Implementations Under Test (IUT) (CAAS single “O” type)

AFTN address	O/R Address (CAAS single “O” type)
IUTAFTN*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/
IUTAFTA*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/
IUTAFTU*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/ <i>Note. – This address has to be unknown and not defined in IUT-A</i>
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLRE/
IUTBFTN*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/
IUTBFTA*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/
IUTBFTU*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/ <i>Note. – This address has to be unknown and not defined in IUT-B</i>
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=X-REGION/OU1=IUTX/CN=IUTXLOOP/

Table 52: Generic look-up table (CAAS single “O” type)

3.4.2 Generic look-up Table for all Implementations Under Test (IUT) (“XF” type)

AFTN address	O/R Address (“XF” type)
IUTAFTN*	/C=XX/A=ICAO/P=IUTLAND-A/
IUTAFTA*	/C=XX/A=ICAO/P=IUTLAND-A/
IUTAFTU*	/C=XX/A=ICAO/P=IUTLAND-A/ <i>Note. – This address has to be unknown and not defined in IUT-A</i>
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLRE/
IUTBFTN*	/C=XX/A=ICAO/P=IUTLAND-B/
IUTBFTA*	/C=XX/A=ICAO/P=IUTLAND-B/
IUTBFTU*	/C=XX/A=ICAO/P=IUTLAND-B/ <i>Note. – This address has to be unknown and not defined in IUT-B</i>
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=AFTN/OU1=IUTXLOOP/

Table 53: Generic look-up table (“XF” type)

Note. – There are further possibilities: IUT-A could have XF addressing scheme whilst IUT-B has CAAS, or vice-versa. In such a case, the corresponding table entries should be selected. To simplify matters it is recommended to use CAAS single “O” type or “XF” type only.

3.5 Local AMHS User address book

3.5.1 Local AMHS User address book for UA of all Implementations Under Test (IUT) (CAAS single “O” type)

Nick name	O/R Address (CAAS single “O” type)
IUTAFTNA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNA/
IUTAFTNB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNB/
IUTAFTNC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNC/
IUTAFTND	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTND/
IUTAFTNE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNE/
IUTAFTNF	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNF/
IUTAFTNG	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNG/
IUTAFTNH	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNH/
IUTAFTNI	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNI/
IUTAFTNJ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNJ/
IUTAFTNK	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNK/
IUTAFTNL	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNL/
IUTAFTNM	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNM/
IUTAFTNN	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNN/
IUTAFTNO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNO/
IUTAFTNP	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNP/
IUTAFTNQ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNQ/
IUTAFTNR	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNR/
IUTAFTNS	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNS/
IUTAFTNT	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNT/
IUTAFTNU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNU/
IUTAFTNV	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNV/
IUTAFTNW	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNW/
IUTAFTNX	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNX/
IUTAFTNY	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNY/
IUTAFTAA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAA/
IUTAFTAB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAB/
IUTAFTAC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAC/
IUTAFTAD	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAD/
IUTAFTAE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAE/
IUTAFTAF	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAF/
IUTAFTAG	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAG/
IUTAFTAH	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAH/
IUTAFTAI	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAI/
IUTAFTAJ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAJ/

IUTAFTAK	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAK/
IUTAFTAL	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAL/
IUTAFTAM	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAM/
IUTAFTAN	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAN/
IUTAFTAO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAO/
IUTAFTAP	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAP/
IUTAFTAQ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAQ/
IUTAFTAR	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAR/
IUTAFTAS	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAS/
IUTAFTAT	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAT/
IUTAFTAU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAU/
IUTAFTAV	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAV/
IUTAFTAW	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAW/
IUTAFTAX	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAX/
IUTAFTAY	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAY/
IUTAFTUU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTUU/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLRE/
IUTBFTNA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNA/
IUTBFTNB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNB/
IUTBFTNC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNC/
till	To be continued till
IUTBFTNY	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNY/
IUTBFTAA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTAA/
till	To be continued till
IUTBFTAY	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTAY/
IUTBFTUU	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTUU/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=X-REGION/OU1=IUTX/CN=IUTXLOOP/

Table 54: Local AMHS User address book (CAAS single “O” type)

3.5.2 Local AMHS User address book for UA of all Implementations Under Test (IUT) (“XF” type)

Nick name	O/R Address (“XF” type)
IUTAFTNA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNA/
IUTAFTNB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNB/
IUTAFTNC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNC/
till	To be continued till
IUTAFTNY	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNY/
IUTAFTAA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTAA/
till	To be continued till
IUTAFTAY	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTAY/
IUTAFTUU	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTUU/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLRE/
IUTBFTNA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNA/
IUTBFTNB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNB/
IUTBFTNC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNC/
till	To be continued till
IUTBFTNY	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNY/
IUTBFTAA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTAA/
till	To be continued till
IUTBFTAY	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTAY/
IUTBFTUU	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTUU/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLRE/
IUTCFTNC	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=AFTN/OU1=IUTXLOOP/

Table 55: Local AMHS User address book (“XF” type)

4 Bilateral Test Procedures

4.1 Submission, Transfer and Delivery Operation (AMHS to AMHS)

4.1.1 IT101 – Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)
Test criteria	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPM) correctly to a peer MTA which delivers the ATS messages (IPM) to the UA of the receiving IUT.
Scenario description	From the UA of IUT-A send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user in the peer IUT, via AMHS. • Message 1 (IT101M01) shall have ATS-message-priority KK. • Message 2 (IT101M02) shall have ATS-message-priority GG. • Message 3 (IT101M03) shall have ATS-message-priority FF. • Message 4 (IT101M04) shall have ATS-message-priority DD. • Message 5 (IT101M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. Verify the messages received by the remote UA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.3.2.3 (ATS-Message-Header)
Test class	Normal AMHS communications (N)

4.1.2 IT102 – Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)
Test criteria	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPM) correctly to a peer MTA which delivers the ATS messages (IPM) to the UA of the receiving IUT.
Scenario description	From the UA of IUT-B send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user in the peer IUT, via AMHS. • Message 1 (IT102M01) shall have ATS-message-priority KK. • Message 2 (IT102M02) shall have ATS-message-priority GG. • Message 3 (IT102M03) shall have ATS-message-priority FF. • Message 4 (IT102M04) shall have ATS-message-priority DD. • Message 5 (IT102M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. Verify the messages received by the remote UA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	3.1.2.2.1 (ATS Message User Agent), 3.1.2.2.2 (ATS Message Server), 3.1.2.2.3.2.3 (ATS-Message-Header)
Test class	Normal AMHS communications (N)

4.2 Gateway Operations (AFTN to AMHS)

4.2.1 IT201 – Convert an AFTN message to AMHS format (IUT-A)

IT201	Convert an AFTN message to AMHS format (IUT-A)
Test criteria	This test is successful, if the sending IUT converts AFTN messages correctly to AMHS messages (IPM).
Scenario description	From the sending IUT send a sequence of AFTN messages addressing a remote AMHS user, consisting of five messages: • AFTN message 1 (IT201M01) shall have priority KK. • AFTN message 2 (IT201M02) shall have priority GG. • AFTN message 3 (IT201M03) shall have priority FF. • AFTN message 4 (IT201M04) shall have priority DD. • AFTN message 5 (IT201M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the IPMs that the AMHS user receives in the receiving IUT. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. In particular: • verify that each message has different ATS-filing-time; • verify that the optional-heading-information element is empty; • check the correct format of the ATS message; • verify the ATS-message-priority and the related message transfer priority for each received message; • compare the ATS-message-text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications (N)

4.2.2 IT202 – Convert an AFTN message to AMHS format (IUT-B)

IT202	Convert an AFTN message to AMHS format (IUT-B)
Test criteria	This test is successful, if the sending IUT converts AFTN messages correctly to AMHS messages (IPM).
Scenario description	From the sending IUT send a sequence of AFTN messages addressing a remote AMHS user, consisting of five messages: • AFTN message 1 (IT202M01) shall have priority KK. • AFTN message 2 (IT202M02) shall have priority GG. • AFTN message 3 (IT202M03) shall have priority FF. • AFTN message 4 (IT202M04) shall have priority DD. • AFTN message 5 (IT202M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the IPMs that the AMHS user receives in the receiving IUT. Verify that the IUT has converted the messages correctly according to Table 3.1.2-8 of the AMHS SARPs – see section 3.1.2.3.4.2. In particular: • verify that each message has different ATS-filing-time; • verify that the optional-heading-information element is empty; • check the correct format of the ATS message; • verify the ATS-message-priority and the related message transfer priority for each received message; • compare the ATS-message-text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2
Test class	Normal AMHS communications (N)

4.3 Gateway Operations (AMHS to AFTN)

4.3.1 IT301 – Convert an IPM generated by the UA of IUT-A to AFTN format

IT301	Convert an IPM to AFTN format (IUT-B)
Test criteria	This test is successful, if the receiving IUT converts IPMs correctly into AFTN format.
Scenario description	Send from IUT-A (UA) a sequence of ATS messages (IPMs) to the IUT-B, addressing an AFTN terminal. • Message 1 (IT301M01) shall have ATS-message-priority KK. • Message 2 (IT301M02) shall have ATS-message-priority GG. • Message 3 (IT301M03) shall have ATS-message-priority FF. • Message 4 (IT301M04) shall have ATS-message-priority DD. • Message 5 (IT301M05) shall have ATS-message-priority SS. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”. Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.
AMHS SARPs reference	3.1.2.3.5.2 (AMHS IPM conversion)
Test class	Normal AMHS communications (N)

4.4 Gateway Operations (AFTN to AMHS to AFTN)

4.4.1 IT401 – Convert an AFTN message to AMHS and back to AFTN format

IT401	Convert an AFTN message to AMHS and back to AFTN format
Test criteria	This test is successful, if the sending IUT-A converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in IUT-B.
Scenario description	From IUT-A send a sequence of AFTN messages addressing a remote AFTN user in IUT-B, consisting of five messages: • AFTN message 1 (IT401M01) shall have priority KK. • AFTN message 2 (IT401M02) shall have priority GG. • AFTN message 3 (IT401M03) shall have priority FF. • AFTN message 4 (IT401M04) shall have priority DD. • AFTN message 5 (IT401M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the AFTN message received by the AFTN user in the IUT-B. • Check the correct format of the AFTN message. • Each AFTN message shall have original filing time. • Each message shall have an empty OHI. • Verify the AFTN priority for each received message. • Compare the AFTN message text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2, 3.1.2.3.5.2
Test class	Normal AMHS communications (N)

4.4.2 IT402 – Convert an AFTN message to AMHS and back to AFTN format

IT402	Convert an AFTN message to AMHS and back to AFTN format
Test criteria	This test is successful, if the sending IUT-B converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in IUT-A.
Scenario description	From IUT-B send a sequence of AFTN messages addressing a remote AFTN user in IUT-A, consisting of five messages: • AFTN message 1 (IT402M01) shall have priority KK. • AFTN message 2 (IT402M02) shall have priority GG. • AFTN message 3 (IT402M03) shall have priority FF. • AFTN message 4 (IT402M04) shall have priority DD. • AFTN message 5 (IT402M05) shall have priority SS. The filing time shall be different in each message and the OHI field of each message shall be empty. Check the AFTN message received by the AFTN user in the IUT-A. • Check the correct format of the AFTN message. • Each AFTN message shall have original filing time. • Each message shall have an empty OHI. • Verify the AFTN priority for each received message. • Compare the AFTN message text with the original AFTN message text.
AMHS SARPs reference	3.1.2.3.4.2, 3.1.2.3.5.2
Test class	Normal AMHS communications (N)

4.5 Gateway Operations – special case scenarios

Note – The following special case scenarios are symmetric. That means, all test-cases have to be performed by IUT-A as well as IUT-B.

4.5.1 IT501 – Distribute an IPM to AMHS and AFTN users

IT501	Distribute an IPM to AMHS and AFTN users
Test criteria	This test is successful, if the receiving IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
Scenario description	From the sending IUT send an ATS message (IPM), addressing both AMHS and AFTN users, at the receiving IUT. The IPM Heading of the message shall contain two primary recipients, which are one AMHS and one AFTN user. The IPM Heading of the next message shall contain additionally, two copy recipients, which are also one AMHS and one AFTN user. Finally the IPM Heading of the last message shall contain additionally two blind copy recipients, which are also one AMHS and one AFTN user. Verify that all the users, whose addresses have been included in the IPM, receive the message correctly.
AMHS SARPs reference	3.1.2.2.1 (ATS message user agent), 3.1.2.2.2 (ATS message server), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications (N)

4.5.2 IT502 – Expand a DL addressing both AMHS and AFTN users

IT502	Expand a DL addressing both AMHS and AFTN users
Test criteria	This test is successful, if the receiving IUT distributes an IPM, addressing AMHS and AFTN users in a distribution list, correctly.
Scenario description	From the sending IUT send an ATS message (IPM) to the receiving IUT. The recipient contained in the MTE addresses a distribution list, for which the receiving IUT is responsible. The distribution list shall have the addresses of one AMHS user and two AFTN users as members. The message shall have the <i>dl-expansion-prohibited</i> attribute set to “false”. Check the messages received in each AFTN user address verifying that each one contains its corresponding address.
AMHS SARPs reference	3.1.2.2.2.1.1 (DL functional group), 3.1.2.3.5.2 (IPM conversion)
Test class	Normal AMHS communications (N)

4.5.3 IT503 – Convert an IPM, if the ATS-message-text contains more than 1800 characters

IT503	Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters
Test criteria	This test is successful, if the IUT, when it receives an ATS message with ATS-message-text longer than 1800 characters, a) rejects the message and returns a NDR, or b) splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Attn. B [1], or c) converts the received IPM into a “long” AFTN message. Note. – The AMHS SARPs (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b).

Scenario description	From the sending IUT send an ATS message (IPM) containing ATS-message-text of 4500 characters to an AFTN recipient of the receiving IUT. <u>If case a is implemented:</u> Verify that the receiving IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the sending User Agent. Verify that the NDR contains the following elements: • “unable-to-transfer” for the non-delivery-reason-code; • “content-too-long” for the non-delivery-diagnostic-code; and • “unable to convert to AFTN due to message text length” for the supplementary-information. <u>If case b is implemented:</u> Verify that (at least) three AFTN messages are received by the AFTN recipient. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM. Verify that the received messages contain the sequence indicators as specified in Attm. B of ICAO Annex 10, Vol. II [1]. <u>If case c is implemented:</u> Verify that the AFTN message is received by the AFTN recipient. Check the correct format of the received AFTN message. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM.
AMHS SARPs reference	3.1.2.3.5.2.1.7
Test class	Normal AMHS communications (N)

4.5.4 IT504 – Split an incoming IPM addressing more than 21 AFTN users

IT504	Split an incoming IPM addressing more than 21 AFTN users
Test criteria	This test is successful, if the receiving IUT receives an ATS message (IPM) addressing more than 21 AFTN users and splits the received IPM into several messages each addressing 21 or less AFTN users. <i>Note. – PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages.</i>
Scenario description	From the sending IUT send an ATS message (IPM) to the receiving IUT. The message shall address 50 (primary) recipients. Verify that the receiving IUT converts the IPM into AFTN format and sends three AFTN messages to its AFTN component. Check the addressee indicators contained in the AFTN messages. Verify that no AFTN recipient is lost and the total number of AFTN addressee indicators contained in all three messages is 50. For example • the first AFTN message contains addressee indicators for the first 21 recipients, • the second AFTN message contains addressee indicators for the next 21 recipients, and • the third AFTN message contains addressee indicators for the remaining 8 recipients.
AMHS SARPs reference	3.1.2.3.5.2.1.8
Test class	Normal AMHS communications (N)

4.5.5 IT505 – Probe Conveyance Test

IT505	Probe Conveyance Test
Test criteria	This test is successful, if the receiving IUT generates a report (DR or NDR), when it receives a probe with AFTN users as intended recipients.
Scenario description	From the sending IUT, send AMHS probes to the receiving IUT: a) addressing two AFTN recipients and one AMHS recipient, b) addressing two AFTN recipients, one of which can be mapped and one of which cannot be mapped onto a valid AFTN address. Verify that the receiving IUT returns a. one DR with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA b. a combined DR and NDR or one DR and one NDR in response to the probe received. Verify in all cases that the DRs reporting about the AFTN addresses which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.
AMHS SARPs reference	3.1.2.3.5.5 (reception of AMHS probe), 3.1.2.3.5.6.2.27
Test class	Normal AMHS communications (N)

4.6 Stress traffic situations

4.6.1 IT601 – Stress load

IT601	Stress load
Test criteria	This test is successful, if both IUTs perform AMHS traffic interchange correctly for a number of messages queued in advance.
Scenario description	Defined numbers of messages (beginning with 100, 200, till 400 messages) have to be selected from the data base or generated by the UA or the AFTN terminal. These messages need to be queued (in MTAs) in both IUTs, preferably by disabling the physical connector used to send information to the underlying network in one of the IUTs. When reconnecting, the messages queued in both IUTs will be sent simultaneously from the two sites, the rate being defined by the line speed of the interconnection, as well as the process followed by each system. No errors due to malfunction of the IUTs should be observed during the interchange period. The time from sending the first till receiving the last message has to be measured and analysed in both IUTs.
AMHS SARPs reference	None
Test class	Normal (forced) AMHS communications (N)

5 Trilateral Test procedures - optional

5.1 Submission/Transfer/Delivery and Relay operations

5.1.1 IT701 – Submission /Transfer/Delivery between the partner MTAs

IT701	Submission / Transfer / Delivery between the partner MTAs
Test criteria	This test is successful, if the messages from all UAs are received by the corresponding UAs of the other the IUTs.
Scenario description	Create “normal” X.400 routing: (see 3.3, AFTN and X.400 Routing Tables) From the UA send an ATS message (IPM) with ATS-message-priority FF addressed to the UA of the other IUTs. • Message 1 (IT701M01) from UA IUT-A to UAs of IUT-B and IUT-C • Message 2 (IT701M02) from UA IUT-B to UAs of IUT-A and IUT-C. • Message 3 (IT701M03) from UA IUT-C to UAs of IUT-A and IUT-B. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. Verify the messages received by both remote UAs. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	None
Test class	Normal AMHS communications (N)

5.1.2 IT702 – Relay operations

IT702	Relay operations
Test criteria	This test is successful, if the message from the sending UA is routed by the IUT in between and received by the addressed UA.
Scenario description	Create a “transfer” X.400 routing: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B and PRMD=IUTLAND-C to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-A and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A and PRMD=IUTLAND-B to IUT-A. From the UA send an ATS message (IPM) with ATS-message-priority FF to one UA of another IUT. • Message 1 (IT702M01) from UA IUT-A to UA of IUT-C • Message 2 (IT702M02) from UA IUT-B to UA of IUT-A. • Message 3 (IT702M03) from UA IUT-C to UA of IUT-B. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. Verify the messages received by the remote UA and passed the IUT in between. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	None
Test class	Normal AMHS communications (N)

5.2 Test of special situations

5.2.1 IT801 – Alternate MTA routing

IT801	Alternate MTA routing
Test criteria	This test is successful, if the message from the sending UA is received by the addressed UA
Scenario description	Create a “normal” X.400 routing: (see 3.3, AFTN and X.400 Routing Tables) Cut the direct connection to the IUT to which you intend to send a message. From the UA send an ATS message (IPM) with ATS-message-priority FF to the UA of the IUT concerned. • Message 1 (IT801M01) from UA IUT-A to UA of IUT-B • Message 2 (IT801M02) from UA IUT-B to UAs of IUT-C. • Message 3 (IT801M03) from UA IUT-C to UAs of IUT-A. Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty. If alternate MTA routing functionality is implemented and configured the message will be forwarded automatically via the “other” connection; otherwise the queued message should be forced to follow the alternate routing by the adequate means (manually). Verify the messages received by the remote UA and passed the IUT in between. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.
AMHS SARPs reference	None
Test class	Normal AMHS communications (N)

5.2.2 IT802– Loop detection

IT802	Loop detection
Test criteria	This test is successful; if the one of the IUT detects that the message has traversed a loop.
Scenario description	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Send a message addressed to PRMD=IUTLAND-X which will be routed by the IUT to the other IUT so that finally the message is performing a loop. Verify that: • the one of the IUTs detects the loop, • this IUT discards the message and • generates a NDR Verify that the sending IUT receives the NDR Repeat the test with all IUTs, so that all sending IUTs have received the NDR.
AMHS SARPs reference	3.1.1, Note 2a (ISO/IEC 10021), 3.1.2.1.6 (AMHS routing), <i>See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1.</i>
Test class	MHS procedural errors (E2)

6 Bilateral Test Procedures – Test Scenarios

6.1 Introduction

The following tables contain the scenarios for the different Interoperability Tests (IT) described in the previous chapters.

The test scenarios consist of several test-cases. The test-case reference is as follows:

ITxxx/TCzz

Test scenario: Txxx where xxx is the scenario number

Test-case: Czz where zz is the number of test-case.

6.2 Submission, Transfer and Delivery Operation (AMHS to AMHS)

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)		
Test-case id: IT101/TC01	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: KK FT: <FT> OHI: TEST IT101/TC01 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: KK - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)		
Test-case id: IT101/TC02	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: GG FT: <FT> OHI: TEST IT101/TC02 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: GG - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)		
Test-case id: IT101/TC03	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: FF FT: <FT> OHI: TEST IT101/TC03 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: FF - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)		
Test-case id: IT101/TC04	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: DD FT: <FT> OHI: TEST IT101/TC04 Get the message with IUTBMHSA (UA-terminal of IUT-B).		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: DD - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT101	Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)		
Test-case id: IT101/TC05	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA: PRI: SS FT: <FT> OHI: TEST IT101/TC05 Get the message with IUTBMHSA (UA-terminal of IUT-B). A RN is submitted when the message is displayed. Note. – Depending on UA implementation the user might be requested to send the RN.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: SS - the ATS-message-filing-time and - the ATS-message-text Check the reception of a RN on the UA IUTAMHSA of the IUT-A system.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: IT102/TC01	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: KK FT: <FT> OHI: TEST IT102/TC01 Get the message with IUTAMHSA (UA-terminal of IUT-A).		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: KK - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: IT102/TC02	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: GG FT: <FT> OHI: TEST IT102/TC02 Get the message with IUTAMHSA (UA-terminal of IUT-A).		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: GG - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: IT102/TC03	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: FF FT: <FT> OHI: TEST IT102/TC03 Get the message with IUTAMHSA (UA-terminal of IUT-A).		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: FF - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: IT102/TC04	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: DD FT: <FT> OHI: TEST IT102/TC04 Get the message with IUTAMHSA (UA-terminal of IUT-A)		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: DD - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT102	Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)		
Test-case id: IT102/TC05	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA: PRI: SS FT: <FT> OHI: TEST IT102/TC05 Get the message with IUTAMHSA (UA-terminal of IUT-A). A RN is submitted when the message is displayed. <i>Note. – Depending on UA implementation the user might be requested to send the RN.</i>		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: SS - the ATS-message-filing-time and - the ATS-message-text Check the reception of a RN on the UA IUTBMHSA of the IUT-B system.		
Test result:	PASS	FAILED	INCONCLUSIVE

6.3 Gateway Operations (AFTN to AMHS)

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: IT201/TC01	Tested functionality: Conversion of messages with different AFTN priorities A KK priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: KK IUTBMHSA <FT> IUTAFTNA TEST IT201/TC01 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: KK - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: IT201/TC02	Tested functionality: Conversion of messages with different AFTN priorities A GG priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: GG IUTBMHSA <FT> IUTAFTNA TEST IT201/TC02 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: GG - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: IT201/TC03	Tested functionality: Conversion of messages with different AFTN priorities An FF priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: FF IUTBMHSA <FT> IUTAFTNA TEST IT201/TC03 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: FF - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: IT201/TC04	Tested functionality: Conversion of messages with different AFTN priorities A DD priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: DD IUTBMHSA <FT> IUTAFTNA TEST IT201/TC04 The message is converted from AFTN into AMHS format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: DD - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT201	Convert an AFTN message to AMHS format (IUT-A)		
Test-case id: IT201/TC05	Tested functionality: Conversion of messages with different AFTN priorities An SS priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B: SS IUTBMHSA <FT> IUTAFTNA TEST IT201/TC05 The message is converted from AFTN into AMHS format in the MTCU of IUT-A. <i>Optional:</i> <i>Generate a RN at the receiving UA IUTBMHSA of IUT-B.</i>		
Test control:	Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system. Check - the ATS-message-priority: PRI: SS - the message transfer priority: URGENT - the ATS-message-filing-time and - the ATS-message-text <i>Optional:</i> If a RN is replied from the UA IUTBMHSA of IUT-B, the MTCU of IUT-A converts it into an SS Ack message which is sent to the AFTN terminal of IUT-A. Check the reception of the SS Ack message at the AFTN terminal IUTAFTNA of IUT-A. Its originator indicator shall be the AFTN address IUTBMHSA, and its text shall be "R <FT> IUTAFTNA", where <FT> denotes the filing time of the subject AFTN message.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT202	Convert an AFTN message to AMHS format (IUT-B)		
Test-case id: IT202/TC01	Tested functionality: Conversion of messages with different AFTN priorities A KK priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: KK IUTAMHSA <FT> IUTBFTNA TEST IT202/TC01 The message is converted from AFTN into AMHS format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: KK - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT202	Convert an AFTN message to AMHS format (IUT-B)		
Test-case id: IT202/TC02	Tested functionality: Conversion of messages with different AFTN priorities A GG priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: GG IUTAMHSA <FT> IUTBFTNA TEST IT202/TC02 The message is converted from AFTN into AMHS format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: GG - the message transfer priority: NON URGENT - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT202	Convert an AFTN message to AMHS format (IUT-B)		
Test-case id: IT202/TC03	Tested functionality: Conversion of messages with different AFTN priorities An FF priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: FF IUTAMHSA <FT> IUTBFTNA TEST IT202/TC03 The message is converted from AFTN into AMHS format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: FF - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT202	Convert an AFTN message to AMHS format (IUT-B)		
Test-case id: IT202/TC04	Tested functionality: Conversion of messages with different AFTN priorities A DD priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: DD IUTAMHSA Test message ID: IT202M04 <FT> IUTBFTNA DD IUTAMHSA TEST IT202/TC04 <FT> IUTBFTNA TEST IT202/TC04 The message is converted from AFTN into AMHS format in the MTCU of IUT-B. Test message ID: IT202M05		
Test control: <FT> IUTBFTNA TEST IT202/TC05	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: DD - the message transfer priority: NORMAL - the ATS-message-filing-time and - the ATS-message-text		
Test result:	PASS	FAILED	INCONCLUSIVE

Test-case id: IT202/TC05	Tested functionality: Conversion of messages with different AFTN priorities An SS priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A: SS IUTAMHSA <FT> IUTBFTNA TEST IT202/TC05 The message is converted from AFTN into AMHS format in the MTCU of IUT-B. Optional: Generate a RN at the receiving UA IUTAMHSA of IUT-A.		
Test control:	Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system. Check - the ATS-message-priority: PRI: SS - the message transfer priority: URGENT - the ATS-message-filing-time and - the ATS-message-text Optional: If a RN is replied from the UA IUTAMHSA of IUT-A, the MTCU of IUT-B converts it into an SS Ack message which is sent to the AFTN terminal of IUT-B. Check the reception of the SS Ack message at the AFTN terminal IUTBFTNA of IUT-B. Its originator indicator shall be the AFTN address IUTAMHSA, and its text shall be "R <FT> IUTBFTNA", where <FT> denotes the filing time of the subject AFTN message.		
Test result:	PASS	FAILED	INCONCLUSIVE

6.4 Gateway Operations (AMHS to AFTN)

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: IT301/TC01	Tested functionality: Conversion of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: KK FT: <FT> OHI: TEST IT301/TC01 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: KK - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: IT301/TC02	Tested functionality: Conversion of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: GG FT: <FT> OHI: TEST IT301/TC02 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message at the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: IT301/TC03	Tested functionality: Conversion of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: FF FT: <FT> OHI: TEST IT301/TC03 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: IT301/TC04	Tested functionality: Conversion of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: DD FT: <FT> OHI: TEST IT301/TC04 The message is converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT301	Convert an IPM to AFTN format (IUT-B)		
Test-case id: IT301/TC05	Tested functionality: Conversion of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B		
Test description:	From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B: PRI: SS FT: <FT> OHI: TEST IT301/TC05 The message is converted from AMHS into AFTN format in the MTCU of IUT-B. <i>Optional:</i> <i>Send an SS Acknowledgement message from the receiving AFTN terminal.</i>		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text <i>Optional:</i> <i>When the SS Ack message is replied, the MTCU of IUT-B converts it into a RN.</i> <i>Check the reception of the RN at the UA IUTAMHSA of IUT-A.</i>		
Test result:	PASS	FAILED	INCONCLUSIVE

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: IT302/TC01	Tested functionality: Conversion of messages with different ATS-message-priorities A KK priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: KK FT: <FT> OHI: TEST IT302/TC01 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: KK - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: IT302/TC02	Tested functionality: Conversion of messages with different ATS-message-priorities A GG priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: GG FT: <FT> OHI: TEST IT302/TC02 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: IT302/TC03	Tested functionality: Conversion of messages with different ATS-message-priorities An FF priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: FF FT: <FT> OHI: TEST IT302/TC03 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: IT302/TC04	Tested functionality: Conversion of messages with different ATS-message-priorities A DD priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: DD FT: <FT> OHI: TEST IT302/TC04 The message is converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT302	Convert an IPM to AFTN format (IUT-A)		
Test-case id: IT302/TC05	Tested functionality: Conversion of messages with different ATS-message-priorities An SS priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.		
Test description:	From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A: PRI: SS FT: <FT> OHI: TEST IT302/TC05 The message is converted from AMHS into AFTN format in the MTCU of IUT-A. <i>Optional:</i> <i>Send an SS Acknowledgement message from the receiving AFTN terminal.</i>		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text <i>Optional:</i> <i>When the SS Ack message is replied, the MTCU of IUT-A converts it into a RN.</i> <i>Check the reception of the RN at the UA IUTBMHSA of ITU-B.</i>		
Test result:	PASS	FAILED	INCONCLUSIVE

6.5 Gateway Operations (AFTN to AMHS to AFTN)

IT401	Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)		
Test-case id: IT401/TC01	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with KK priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: KK IUTBFTNA <FT> IUTAFTNA TEST IT401/TC01 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B. .		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: KK - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT401	Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)		
Test-case id: IT401/TC02	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with GG priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: GG IUTBFTNA <FT> IUTAFTNA TEST IT401/TC02 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT401	Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)		
Test-case id: IT401/TC03	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with FF priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: FF IUTBFTNA <FT> IUTAFTNA TEST IT401/TC03 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B. .		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT401	Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)		
Test-case id: IT401/TC04	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with DD priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: DD IUTBFTNA <FT> IUTAFTNA TEST IT401/TC04 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B. .		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT401	Convert an AFTN message to an IPM and back to AFTN format (IUT-A to IUT-B)		
Test-case id: IT401/TC05	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with SS priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
Test description:	From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B: SS IUTBFTNA <FT> IUTAFTNA TEST IT401/TC05 The message is - converted from AFTN into AMHS format in the MTCU of IUT-A, - transferred via the MTA of IUT A to the MTA of IUT-B, - routed to the MTCU of IUT-B and - converted from AMHS into AFTN format in the MTCU of IUT-B. <i>Optional:</i> <i>Send an SS Acknowledgement message from the receiving AFTN terminal.</i>		
Test control:	Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text <i>Optional:</i> <i>When the SS Ack message is replied, the MTCU of IUT-B converts it into a RN, the RN is re-converted to an SS Acknowledgement message in the MTCU of IUT-A.</i> <i>Check the reception of the SS Acknowledgement at the AFTN terminal IUTAFTNA of IUT-A.</i>		
Test result:	PASS	FAILED	INCONCLUSIVE

IT402	Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)		
Test-case id: IT402/TC01	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with KK priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: KK IUTAFTNA <FT> IUTBFTNA TEST IT402/TC01 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: KK - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT402	Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)		
Test-case id: IT402/TC02	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with GG priority will be sent from IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: GG IUTAFTNA <FT> IUTBFTNA TEST IT402/TC02 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: GG - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT402	Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)		
Test-case id: IT402/TC03	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with FF priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: FF IUTAFTNA <FT> IUTBFTNA TEST IT402/TC03 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: FF - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT402	Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)		
Test-case id: IT402/TC04	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with DD priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: DD IUTAFTNA <FT> IUTBFTNA TEST IT402/TC04 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: DD - the AFTN filing time and - the AFTN message text		
Test result:	PASS	FAILED	INCONCLUSIVE

IT402	Convert an AFTN message to an IPM and back to AFTN format (IUT-B to IUT-A)		
Test-case id: IT402/TC05	Tested functionality: Conversion of messages with different AFTN priorities An AFTN message with SS priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
Test description:	From the AFTN terminal of IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A: SS IUTAFTNA <FT> IUTBFTNA TEST IT402/TC05 The message is - converted from AFTN into AMHS format in the MTCU of IUT-B, - transferred via the MTA of IUT B to the MTA of IUT-A, - routed to the MTCU of IUT-A and - converted from AMHS into AFTN format in the MTCU of IUT-A. Optional: Send an SS Acknowledgement message from the receiving AFTN terminal.		
Test control:	Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system. Check - the AFTN priority: SS - the AFTN filing time and - the AFTN message text Optional: When the SS Ack message is replied, the MTCU of IUT-A converts it into a RN, the RN is re-converted to an SS Acknowledgement message in the MTCU of IUT-B. Check the reception of the SS Acknowledgement at the AFTN terminal IUTBFTNA of ITU-B.		
Test result:	PASS	FAILED	INCONCLUSIVE

6.6 Gateway Operations – special cases

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: IT501/TC01	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients addressing an AFTN terminal and a UA in IUT-B.		
Test description:	From IUTAMHSA send the following message to: <u>Primary Recipients</u> : IUTBMHSA and IUTBFTNA PRI: FF FT: <FT> TEST IT501/TC01 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by IUTBFTNA and IUTBMHSA in the IUT-B configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: IT501/TC02	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients addressing an AFTN terminal and a UA in IUT-A.		
Test description:	From IUTBMHSA send the following message to: <u>Primary Recipients:</u> IUTAMHSA and IUTAFTNA PRI: FF FT: <FT> TEST IT501/TC02 Get the message at the UA- and AFTN terminals of IUT-A.		
Test control:	Check the correct reception of the message by IUTAFTNA and IUTAMHSA in the IUT-A configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: IT501/TC03	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-B.		
Test description:	From IUTAMHSA send the following message to: <u>Primary Recipients</u>: IUTBMHSA and IUTBFTNA <u>Copy Recipients</u>: IUTBMHSB and IUTBFTNB PRI: FF FT: <FT> TEST IT501/TC03 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by IUTBFTNA, IUTBFTNB and IUTBMHSA, IUTBMHSB in the IUT-B configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: IT501/TC04	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-A.		
Test description:	From IUTBMHSA send the following message to: <u>Primary Recipients</u>: IUTAMHSA and IUTAFTNA <u>Copy Recipients</u>: IUTAMHSB and IUTAFTNB PRI: FF FT: <FT> TEST IT501/TC04 Get the message at the UA- and AFTN terminals of IUT-A.		
Test control:	Check the correct reception of the message by IUTAFTNA, IUTAFTNB and IUTAMHSA, IUTAMHSB in the IUT-A configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: IT501/TC05	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients, Copy Recipients and Blind Copy Recipients, addressing AFTN terminals and UAs in IUT-B.		
Test description:	From IUTAMHSA send the following message to: <u>Primary Recipients</u>: IUTBMHSA and IUTBFTNA <u>Copy Recipients</u>: IUTBMHSA and IUTBFTNB <u>Blind Copy Recipients</u>: IUTBMHSC and IUTBFTNC PRI: FF FT: <FT> TEST IT501/TC05 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check that at the AFTN Station of IUT-B one message with addresses IUTBFTNA, IUTBFTNB and another message with the address IUTBFTNC is received. Check that at the UA IUTBMHSA one IPM is received which contains the Primary Recipients IUTBMHSA, IUTBFTNA and the Copy Recipients IUTBMHSA, IUTBFTNB, but no Blind Copy Recipients. Check that at the UA IUTBMHSC one IPM is received which contains the Primary Recipients IUTBMHSA, IUTBFTNA, the Copy Recipients IUTBMHSA, IUTBFTNB and one Blind Copy Recipient IUTBMHSC.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT501	Distribute an IPM to AMHS and AFTN users		
Test-case id: IT501/TC06	Tested functionality: Distribution of IPM A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients, Copy Recipients and Blind Copy Recipients, addressing AFTN terminals and UAs in IUT-A.		
Test description:	From IUTBMHSA send the following message to: <u>Primary Recipients</u>: IUTAMHSA and IUTAFTNA <u>Copy Recipients</u>: IUTAMHSB and IUTAFTNB <u>Blind Copy Recipients</u>: IUTAMHSC and IUTAFTNC PRI: FF FT: <FT> TEST IT501/TC06 Get the message at the UA- and AFTN terminals of IUT-A.		
Test control:	Check that at the AFTN Station of IUT-A one message with addresses IUTAFTNA, IUTAFTNB and another message with the address IUTAFTNC is received. Check that at the UA IUTAMHSA one IPM is received which contains the Primary Recipients IUTAMHSA, IUTAFTNA and the Copy Recipients IUTAMHSB, IUTAFTNB, but no Blind Copy Recipients. Check that at the UA IUTAMHSC one IPM is received which contains the Primary Recipients IUTAMHSA, IUTAFTNA, the Copy Recipients IUTAMHSB, IUTAFTNB and one Blind Copy Recipient IUTAMHSC.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT502	Expand a DL addressing both AMHS and AFTN users		
Test-case id: IT502/TC01	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-A addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-B.		
Test description:	IUTADLLO must be configured as a local DL entry in IUT-A containing the addresses IUTBFTNA IUTBFTNB and IUTBMHSA. From IUTAMHSA send the following message to IUTADLLO: PRI: FF FT: <FT> TEST IT502/TC01 Get the message at the UA and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by AFTN terminals IUTBFTNA, IUTBFTNB and UA IUTBMHSA in the IUT-B configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT502	Expand a DL addressing both AMHS and AFTN users		
Test-case id: IT502/TC02	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-B addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-A.		
Test description:	IUTBDLLO must be configured as a local DL entry in IUT-A containing the addresses IUTAFTNA, IUTAFTNB and IUTAMHSA. From IUTBMHSA send the following message to IUTBDLLO: PRI: FF FT: <FT> TEST IT502/TC02 Get the message at the UA and AFTN terminals of IUT-A.		
Test control:	Check the correct reception of the message by AFTN terminals IUTAFTNA, IUTAFTNB and UA IUTAMHSA in the IUT-A configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT502	Expand a DL addressing both AMHS and AFTN users		
Test-case id: IT502/TC03	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-A addressing a remote DL in IUT-B which contains addresses of AFTN terminals and the UA in IUT-B		
Test description:	IUTBDLRE must be configured as a local DL entry in IUT-B containing the addresses IUTBFTNA, IUTBFTNB and IUTBMHSA. From IUTAMHSA send the following message to IUTBDLRE: PRI: FF FT: <FT> TEST IT502/TC03 Get the message at the UA and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by AFTN terminals IUTBFTNA, IUTBFTNB and UA IUTBMHSA in the IUT-B configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT502	Expand a DL addressing both AMHS and AFTN users		
Test-case id: IT502/TC04	Tested functionality: Expanding of Distribution list The message will be sent from a UA on IUT-B addressing a remote DL in IUT-A which contains addresses of AFTN terminals and the UA in IUT-A		
Test description:	IUTADLRE must be configured as a local DL entry in IUT-A containing the addresses IUTAFTNA, IUTAFTNB and IUTAMHSA. From IUTBMHSA send the following message to IUTADLRE: PRI: FF FT: <FT> TEST IT502/TC04 Get the message at the UA- and AFTN terminals of IUT-B.		
Test control:	Check the correct reception of the message by AFTN terminals IUTAFTNA, IUTAFTNB and UA IUTAMHSA in the IUT-A configuration.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT503	Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters		
Test-case id: IT503/TC01	Tested functionality: Conversion of “long” messages A message with normal priority and length of about 4500 characters is sent from the IUT-A to the IUT-B		
Test description:	From UA IUTAMHSA of IUT-A send the following message to the AFTN terminal IUTBFTNA: PRI: FF FT: <FT> OHI: TEST IT503/TC01 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... 123456789012345678901234567890123456789012345678901234567890123456789 END		
Test control:	The SARPs (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). If the system provides “long AFTN message” capability the message will be converted (case c). <u>If case a is implemented:</u> The message is not conveyed to the AFTN component. Check the Report received at the User Agent position IUTAMHSA Verify the following Per-Recipient-Report Non-Delivery information: - Actual-recipient-name: MF-form address of IUTBFTNA - reason code 1 signifies "unable-to-transfer" - diagnostic code 7 signifies "content-too-long". - supplementary information: "unable to convert to AFTN due to message text length". <u>If case b is implemented:</u> Check that IUTBFTNA receives several messages. <u>If case c is implemented:</u> Check that IUTBFTNA receives one message.		
Test result:	PASS	FAILED	INCONCLUSIVE
	a / b / c		

IT503	Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters		
Test-case id: IT503/TC02	Tested functionality: Conversion of “long” messages A message with normal priority and length of about 4500 characters is sent from the IUT-B to the IUT-A		
Test description:	From UA IUTBMHSA of IUT-B send the following message to the AFTN terminal IUTAFTNA: PRI: FF FT: <FT> OHI: TEST IT503/TC02 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... 123456789012345678901234567890123456789012345678901234567890123456789 END		
Test control:	The SARPs (3.1.2.3.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). If the system provides “long AFTN message” capability the message will be converted (case c). <u>If case a is implemented:</u> The message is not conveyed to the AFTN component. Check the Report received at the User Agent position IUTBMHSA Verify the following Per-Recipient-Report Non-Delivery information: - Actual-recipient-name: MF-form address of IUTAFTNA - reason code 1 signifies "unable-to-transfer" - diagnostic code 7 signifies "content-too-long". - supplementary information: "unable to convert to AFTN due to message text length". <u>If case b is implemented:</u> Check that IUTAFTNA receives several messages. <u>If case c is implemented:</u> Check that IUTAFTNA receives one message.		
Test result:	PASS	FAILED	INCONCLUSIVE
	a / b / c		

IT504	Split an incoming IPM addressing more than 21 AFTN users		
Test-case id: IT504/TC01	Tested functionality: Conversion of messages with more than 21 addresses A message with normal priority containing 50 recipients is sent from the IUT-A to the IUT-B.		
Test description:	From IUTAMHSA send the following message to the following addressees (all recipients in the corresponding MF-Form): IUTBFTNA, IUTBFTNB, IUTBFTNC, IUTBFTND, IUTBFTNE, IUTBFTNF, IUTBFTNG, IUTBFTNH, IUTBFTNI, IUTBFTNJ, IUTBFTNK, IUTBFTNL, IUTBFTNM, IUTBFTNN, IUTBFTNO, IUTBFTNP, IUTBFTNQ, IUTBFTNR, IUTBFTNS, IUTBFTNT, IUTBFTNU, IUTBFTNV, IUTBFTNW, IUTBFTNX, IUTBFTNY, IUTBFTAA, IUTBFTAB, IUTBFTAC, IUTBFTAD, IUTBFTAE, IUTBFTAF, IUTBFTAG, IUTBFTAH, IUTBFTAI, IUTBFTAJ, IUTBFTAK, IUTBFTAL, IUTBFTAM, IUTBFTAN, IUTBFTAO, IUTBFTAP, IUTBFTAQ, IUTBFTAR, IUTBFTAS, IUTBFTAT, IUTBFTAU, IUTBFTAV, IUTBFTAW, IUTBFTAX, IUTBFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC01		
Test control:	PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages. The message is split into 3 copies, each conveyed to the AFTN component. The first copy is addressed to 21 of the 50 addressee indicators. The second copy is addressed to further 21 addressee indicators. The third copy is addressed to the remaining 8 of the 50 addressee indicators. Check the correct reception of the messages on the AFTN terminal of IUT-B.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT504	Split an incoming IPM addressing more than 21 AFTN users		
Test-case id: IT504/TC02	Tested functionality: Conversion of messages with more than 21 addresses A message with normal priority containing 50 recipients is sent from the IUT-B to the IUT-A.		
Test description:	From IUTBMHSA send the following message to the following addressees (all recipients in the corresponding MF-Form): IUTAFTNA, IUTAFTNB, IUTAFTNC, IUTAFTND, IUTAFTNE, IUTAFTNF, IUTAFTNG, IUTAFTNH, IUTAFTNI, IUTAFTNJ, IUTAFTNK, IUTAFTNL, IUTAFTNM, IUTAFTNN, IUTAFTNO, IUTAFTNP, IUTAFTNQ, IUTAFTNR, IUTAFTNS, IUTAFTNT, IUTAFTNU, IUTAFTNV, IUTAFTNW, IUTAFTNX, IUTAFTNY, IUTAFTAA, IUTAFTAB, IUTAFTAC, IUTAFTAD, IUTAFTAE, IUTAFTAF, IUTAFTAG, IUTAFTAH, IUTAFTAI, IUTAFTAJ, IUTAFTAK, IUTAFTAL, IUTAFTAM, IUTAFTAN, IUTAFTAO, IUTAFTAP, IUTAFTAQ, IUTAFTAR, IUTAFTAS, IUTAFTAT, IUTAFTAU, IUTAFTAV, IUTAFTAW, IUTAFTAX, IUTAFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC02		
Test control:	PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages. The message is split into 3 copies, each conveyed to the AFTN component. The first copy is addressed to 21 of the 50 addressee indicators. The second copy is addressed to further 21 addressee indicators. The third copy is addressed to the remaining 8 of the 50 addressee indicators. Check the correct reception of the messages on the AFTN terminal of IUT-A.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT505	Probe Conveyance Test		
Test-case id: IT505/TC01	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-A to IUT-B, addressing AFTN terminals and UAs in IUT-B.		
Test description:	From IUTAMHSA send a probe to IUTBFTNA, IUTBFTNB, IUTBMHSA.		
Test control:	On IUT-A UA IUTAMHSA: One Delivery Report (DR) with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA Verify that the DR reporting about the AFTN addresses contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT505	Probe Conveyance Test		
Test-case id: IT505/TC02	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-B to IUT-A, addressing AFTN terminals and UAs in IUT-A.		
Test description:	From IUTBMHSA send a probe to IUTAFTNA, IUTAFTNB, IUTAMHSA.		
Test control:	On IUT-B UA IUTBMHSA: One Delivery Report (DR) with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA Verify that the DR reporting about the AFTN addresses contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT505	Probe Conveyance Test		
Test-case id: IT505/TC03	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-A to IUT-B, containing the address of an AFTN terminal of IUT-B and an MF address which cannot be translated by the MTCU of IUT-B.		
Test description:	From IUTAMHSA send a probe to IUTBFTNA, IUTBFTUU (address is not provided in the look-up table of IUT-B).		
Test control:	Verify that at UA IUTAMHSA: A Delivery Report, containing the reported recipient IUTBFTNA and a NDR, containing the reported recipient IUTBFTUU, with: - non-delivery-reason-code set to “unable-to-transfer”, - non-delivery-diagnostic-code set to “unrecognized-OR-name” are received. Verify that the DR reporting about the address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT505	Probe Conveyance Test		
Test-case id: IT505/TC04	Tested functionality: Processing of Probe Messages by UA and MTCU. The messages will be sent from a UA on IUT-B to IUT-A, containing the address of an AFTN terminal of IUT-A and an MF address which cannot be translated by the MTCU of IUT-A.		
Test description:	From IUTBMHSA send a probe to IUTAFTNA, IUTAFTUU (address is not provided in the look-up table of IUT-A)		
Test control:	Verify that at UA IUTBMHSA: A Delivery Report, containing the reported recipient IUTAFTNA and a NDR, containing the reported recipient IUTAFTUU, with: - non-delivery-reason-code set to “unable-to-transfer”, - non-delivery-diagnostic-code set to “unrecognized-OR-name” are received. Verify that the DR reporting about the address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.		
Test result:	PASS	FAILED	INCONCLUSIVE

6.7 Stress traffic situations

IT601	Stress load		
Test-case id: IT601/TC01	Tested functionality: AMHS traffic interchange after queuing of an amount of messages After queuing of an amount of messages both IUTs start sending a burst of messages		
Test description:	Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs. Select from the data base or generated by the UA and/or the AFTN terminal 100 messages in both IUTs. For example, from IUTAFTNA send 100 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 100 messages to IUTAFTNA, IUTAMHSA, In the result on IUT-A and IUT-B there are 100 messages queued in direction to the peer IUT. Re-establish the connection between IUT-A and IUT-B. The queued messages will be sent simultaneously from both IUTs. Measure the time: from re-establishing the connection till sending the first message and from sending the first till sending the last message. Measure the time: from re-establishing the connection till receiving the first message and from receiving the first message till receiving the last message.		
Test control:	Check that all 100 messages are received at the addressed terminals. Check that no errors or malfunction are reported or observed at the IUTs during the interchange period. Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as "FAILED".		
Test result:	PASS	FAILED	INCONCLUSIVE

The following table can be used to make notes of the Test Control Result.

Test Control	Result IT601/TC01	Result IT601/TC02	Result IT601/TC03
1. Notice the time of re-establishing the connection sending direction.			
2. Notice the time of sending the first message.			
3. Notice the time of sending the last message.			
4. Notice the time of re-establishing the connection receiving direction.			
5. Notice the time of receiving the first message.			
6. Notice the time of receiving the last message.			
7. Notice the number of messages received (shall be equal to the number of messages expected.)			
8. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.			
9. Check the event logging / traffic traces for NDRs. (No NDRs are awaited.)			
10. Check for Control Position events. (No related events are awaited.)			
11. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).			
12. Monitor the underlying network infrastructure (network specialist).			
13. At both sides note the amount of time needed to flush the queues. (Unacceptable delays shall be treated as "FAILED")			

IT601	Stress load		
Test-case id: IT601/TC02	Tested functionality: AMHS traffic interchange after queuing of an amount of messages After queuing of an amount of messages both IUTs start sending a burst of messages		
Test description:	Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs. Select from the data base or generated by the UA and/or the AFTN terminal 200 messages in both IUTs. For example, from IUTAFTNA send 200 messages to IUTBFTNA, IUTBMHSA, and from IUTBFTNA send 200 messages to IUTAFTNA, IUTAMHSA, In the result on IUT-A and IUT-B there are 200 messages queued in direction to the peer IUT. Re-establish the connection between IUT-A and IUT-B. The queued messages will be sent simultaneously from both IUTs. Measure the time: • from re-establishing the connection till sending the first message and • from sending the first till sending the last message. Measure the time: • from re-establishing the connection till receiving the first message and • from receiving the first message till receiving the last message.		
Test control:	Check that all 200 messages are received at the addressed terminals. Check that no errors or malfunction are reported or observed at the IUTs during the interchange period. Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT601	Stress load		
Test-case id: IT601/TC03	Tested functionality: AMHS traffic interchange after queuing of an amount of messages After queuing of an amount of messages both IUTs start sending a burst of messages		
Test description:	Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs. Select from the data base or generated by the UA and/or the AFTN terminal 400 messages in both IUTs. For example, from IUTAFTNA send 400 messages to IUTBFTNA, IUTBMHSA, and from IUTBFTNA send 400 messages to IUTAFTNA, IUTAMHSA, In the result on IUT-A and IUT-B there are 400 messages queued in direction to the peer IUT. Re-establish the connection between IUT-A and IUT-B. The queued messages will be sent simultaneously from both IUTs. Measure the time: • from re-establishing the connection till sending the first message and • from sending the first till sending the last message. Measure the time: • from re-establishing the connection till receiving the first message and • from receiving the first message till receiving the last message.		
Test control:	Check that all 400 messages are received at the addressed terminals. Check that no errors or malfunction are reported or observed at the IUTs during the interchange period. Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.		
Test result:	PASS	FAILED	INCONCLUSIVE

7 Trilateral Test procedures - optional

7.1 Submission/Transfer/Delivery and Relay operations

IT701	Submission / Transfer / Delivery		
Test-case id: IT701/TC01	Tested functionality: Submission, transfer and delivery of messages to different IUTs An IPM submitted in IUT-A is transferred to IUT-B, IUT-C and delivered to the UAs of IUT-B, IUT-C.		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C. From UA IUTAMHSA send an ATS message (IPM) to UA IUTBMHSA and IUTCMHSA: PRI: FF FT: <FT> OHI: TEST IT701/TC01		
Test control:	Verify that the message is received by both remote UAs in IUT-B and IUT-C. In particular, verify: • ATS-message-priority FF, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT701	Submission / Transfer / Delivery		
Test-case id: IT701/TC02	Tested functionality: Submission, transfer and delivery of messages to different IUTs An IPM submitted in IUT-B is transferred to IUT-C, IUT-A and delivered to the UAs of IUT-C, IUT-A.		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-B routes PRMD=IUTLAND-C to IUT-C and PRMD=IUTLAND-A to IUT-A. From the UA IUTBMHSA send an ATS message (IPM) to UA IUTAMHSA and IUTCMHSA. PRI: FF FT: <FT> OHI: TEST IT701/TC02		
Test control:	Verify that the message is received by both remote UAs in IUT-A and IUT-C. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT701	Submission / Transfer / Delivery between the partner MTAs		
Test-case id: IT701/TC03	Tested functionality: Submission, transfer and delivery of messages to different IUTs An IPM submitted in IUT-C is transferred to IUT-A, IUT-B and delivered to the UA of IUT-A, IUT-B.		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B. From the UA IUTCMHSA send an ATS message (IPM) to UA IUTAMHSA and IUTBMHSA. PRI: FF FT: <FT> OHI: TEST IT701/TC03		
Test control:	Verify that the messages is received by both remote UAs in IUT-A and IUT-B. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT702	Relay operations		
Test-case id: IT702/TC01	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA and transferred from one IUT to another IUT via a “relay” IUT.		
Test description:	Modify the X.400 routing as follows: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B and PRMD=IUTLAND-C to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-C to IUT-C. Hence, IUT-B is the “relay” IUT. From the UA IUTAMHSA send an ATS message (IPM) to the UA IUTCMHSA. PRI: FF FT: <FT> OHI: TEST IT702/TC01		
Test control:	Verify that the message has passed the IUT-B in between (if possible). Verify that the message is received by the UA IUTCMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT702	Relay operations		
Test-case id: IT702/TC02	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA and transferred from one IUT to another IUT via a “relay” IUT.		
Test description:	Modify the X.400 routing as follows: The X.400 routing table of IUT-B routes PRMD=IUTLAND-A and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A. Hence, IUT-C is the “relay” IUT. From the UA IUTBMHSA send an ATS message (IPM) to the UA IUTAMHSA. PRI: FF FT: <FT> OHI: TEST IT702/TC02		
Test control:	Verify that the message has passed the IUT-C in between (if possible). Verify that the message is received by the UA IUTAMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT702	Relay operations		
Test-case id: IT702/TC03	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA and transferred from one IUT to another IUT via a “relay” IUT.		
Test description:	Modify the X.400 routing as follows: The X.400 routing table of IUT-C routes PRMD=IUTLAND-A and PRMD=IUTLAND-B to IUT-A. The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B. Hence, IUT-A is the “relay” IUT. From the UA IUTCMHSA send an ATS message (IPM) to the UA IUTBMHSA. PRI: FF FT: <FT> OHI: TEST IT702/TC03		
Test control:	Verify that the message has passed the IUT-A in between (if possible). Verify that the message is received by the UA IUTBMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

7.2 Test of special situations

IT801	Alternate MTA routing		
Test-case id: IT801/TC01	Tested functionality: Alternate routing capability An ATS message (IPM) queued due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT).		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B. Cut the direct connection from IUT-A to IUT-B. From the UA IUTAMHSA send an ATS message (IPM) to the UA IUTBMHSA. If alternate MTA routing functionality is implemented and configured in IUT-A, the message will be transferred automatically via the “alternate” connection. Otherwise: Reroute the queued message manually (an operational procedure for should exist).		
Test control:	Verify that the messages had passed the IUT-C in between (if possible). Verify the message received by the UA IUTBMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT801	Alternate MTA routing		
Test-case id: IT801/TC02	Tested functionality: Alternate routing capability An ATS message (IPM) queued due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT).		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-B routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-C to IUT-C. Cut the direct connection from IUT-B to IUT-C. From the UA IUTBMHSA send an ATS message (IPM) to the UA IUTCMHSA. If alternate MTA routing functionality is implemented and configured in IUT-B, the message will be transferred automatically via the “alternate” connection. Otherwise: Reroute the queued message manually (an operational procedure for should exist).		
Test control:	Verify that the message had passed the IUT-A in between (if possible). Verify the message received by the UA of IUTCMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT801	Alternate MTA routing		
Test-case id: IT801/TC03	Tested functionality: Alternate routing capability An ATS message (IPM) queued due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT).		
Test description:	Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-B routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-C to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B. Cut the direct connection from IUT-C to IUT-A. From the UA IUTCMHSA send an ATS message (IPM) to the UA IUTAMHSA. If alternate MTA routing functionality is implemented and configured in IUT-C, the message will be transferred automatically via the “alternate” connection. Otherwise: Reroute the queued message manually (an operational procedure for should exist).		
Test control:	Verify that the message had passed the IUT-B in between (if possible). Verify the message received by the UA of IUTAMHSA. In particular, verify: • ATS-message-priority, • ATS-message-filing-time, • ATS-message-text.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT802	Loop detection		
Test-case id: IT802/TC01	Tested functionality: A message traversing a loop is detected by an IUT.		
Test description:	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. From UA IUTAMHSA send a message (IT802/M01) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop. One IUT detects the looping message, stops the further transfer and non-delivers the message.		
Test control:	Verify that: • the message is discarded • at UA IUTAMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT802	Loop detection		
Test-case id: IT802/TC02	Tested functionality: A message traversing a loop is detected by an IUT.		
Test description:	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. From UA IUTBMHSA send a message (IT802/M02) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop. One IUT detects the looping message, stops the further transfer and non-delivers the message.		
Test control:	Verify that: • the message is discarded • at UA IUTBMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.		
Test result:	PASS	FAILED	INCONCLUSIVE

IT802	Loop detection		
Test-case id: IT802/TC03	Tested functionality: A message traversing a loop is detected by an IUT.		
Test description:	Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. From UA IUTCMHSA send a message (IT802/M03) addressed to IUTXLOOP. The message will be routed cyclically so that it is finally performing a loop. One IUT detects the looping message, stops the further transfer and non-delivers the message.		
Test control:	Verify that: • the message is discarded • at UA IUTCMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.		
Test result:	PASS	FAILED	INCONCLUSIVE

8 Test message templates

8.1 Test message templates for IUT-A

8.1.1 Input device User Agent (UA): IUTAMHSA

From UA IUTAMHSA	to UA IUTBMHSA
Test message ID: IT101M01	PRI: KK FT: <FT> OHI: TEST IT101/TC01
Test message ID: IT101M02	PRI: GG FT: <FT> OHI: TEST IT101/TC02
Test message ID: IT101M03	PRI: FF FT: <FT> OHI: TEST IT101/TC03
Test message ID: IT101M04	PRI: DD FT: <FT> OHI: TEST IT101/TC04
Test message ID: IT101M05	PRI: SS FT: <FT> OHI: TEST IT101/TC05

From UA IUTAMHSA	to UA IUTBFTNA
Test message ID: IT301M01	PRI: KK FT: <FT> OHI: TEST IT301/TC01
Test message ID: IT301M02	PRI: GG FT: <FT> OHI: TEST IT301/TC02
Test message ID: IT301M03	PRI: FF FT: <FT> OHI: TEST IT301/TC03
Test message ID: IT301M04	PRI: DD FT: <FT> OHI: TEST IT301/TC04
Test message ID: IT301M05	PRI: SS FT: <FT> OHI: TEST IT301/TC05

From UA IUTAMHSA Test message ID: IT501M01	<u>To Primary Recipients:</u> IUTBMHSA and IUTBFTNA PRI: FF FT: <FT> OHI: TEST IT501/TC01
Test message ID: IT501M03	<u>To Primary Recipients:</u> IUTBMHSA and IUTBFTNA <u>To Copy Recipients:</u> IUTBMHSB and IUTBFTNB PRI: FF FT: <FT> OHI: TEST IT501/TC03
Test message ID: IT501M05	<u>To Primary Recipients:</u> IUTBMHSA and IUTBFTNA <u>To Copy Recipients:</u> IUTBMHSB and IUTBFTNB <u>To Blind Copy Recipients:</u> IUTBMHSC and IUTBFTNC PRI: FF FT: <FT> OHI: TEST IT501/TC05

From UA IUTAMHSA Test message ID: IT502M01	To: IUTADLLO PRI: FF FT: <FT> OHI: TEST IT502/TC01
Test message ID: IT502M03	To: IUTBDLRE PRI: FF FT: <FT> OHI: TEST IT502/TC03
From UA IUTAMHSA Test message ID: IT503M01	To: AFTN terminal IUTBFTNA PRI: FF FT: <FT> OHI: TEST IT503/TC01 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... <63 figure lines 1234567890 ... 123456789> 123456789012345678901234567890123456789012345678901234567890123456789 END
From UA IUTAMHSA Test message ID: IT504M01	To IUTBFTNA, IUTBFTNB, IUTBFTNC, IUTBFTND, IUTBFTNE, IUTBFTNF, IUTBFTNG, IUTBFTNH, IUTBFTNI, IUTBFTNJ, IUTBFTNK, IUTBFTNL, IUTBFTNM, IUTBFTNN, IUTBFTNO, IUTBFTNP, IUTBFTNQ, IUTBFTNR, IUTBFTNS, IUTBFTNT, IUTBFTNU, IUTBFTNV, IUTBFTNW, IUTBFTNX, IUTBFTNY, IUTBFTAA, IUTBFTAB, IUTBFTAC, IUTBFTAD, IUTBFTAE, IUTBFTAF, IUTBFTAG, IUTBFTAH, IUTBFTAI, IUTBFTAJ, IUTBFTAK, IUTBFTAL, IUTBFTAM, IUTBFTAN, IUTBFTAO, IUTBFTAP, IUTBFTAQ, IUTBFTAR, IUTBFTAS, IUTBFTAT, IUTBFTAU, IUTBFTAV, IUTBFTAW, IUTBFTAX, IUTBFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC01

8.1.2 Input device AFTN Terminal: IUTAFTNA

From AFTN Terminal IUTAFTNA	To UA IUTBMHSA
Test message ID: IT201M01	KK IUTBMHSA <FT> IUTAFTNA TEST IT201/TC01
Test message ID: IT201M02	GG IUTBMHSA <FT> IUTAFTNA TEST IT201/TC02
Test message ID: IT201M03	FF IUTBMHSA <FT> IUTAFTNA TEST IT201/TC03
Test message ID: IT201M04	DD IUTBMHSA <FT> IUTAFTNA TEST IT201/TC04
Test message ID: IT201M05	SS IUTBMHSA <FT> IUTAFTNA TEST IT201/TC05

From AFTN Terminal IUTAFTNA	to AFTN Terminal IUTBFTNA
Test message ID: IT401M01	KK IUTBFTNA <FT> IUTAFTNA TEST IT401/TC01
Test message ID: IT401M02	GG IUTBFTNA <FT> IUTAFTNA TEST IT401/TC02
Test message ID: IT401M03	FF IUTBFTNA <FT> IUTAFTNA TEST IT401/TC03
Test message ID: IT401M04	DD IUTBFTNA <FT> IUTAFTNA TEST IT401/TC04
Test message ID: IT401M05	SS IUTBFTNA <FT> IUTAFTNA TEST IT401/TC05

8.2 Test message templates for IUT-B

8.2.1 Input device User Agent (UA): IUTBMHSA

From UA IUTBMHSA	to UA IUTAMHSA
Test message ID: IT102M01	PRI: KK FT: <FT> OHI: TEST IT102/TC01
Test message ID: IT102M02	PRI: GG FT: <FT> OHI: TEST IT102/TC02
Test message ID: IT102M03	PRI: FF FT: <FT> OHI: TEST IT102/TC03
Test message ID: IT102M04	PRI: DD FT: <FT> OHI: TEST IT102/TC04
Test message ID: IT102M05	PRI: SS FT: <FT> OHI: TEST IT102/TC05

From UA IUTBMHSA	to AFTN Terminal IUTAFTNA
Test message ID: IT302M01	PRI: KK FT: <FT> OHI: TEST IT302/TC01
Test message ID: IT302M02	PRI: GG FT: <FT> OHI: TEST IT302/TC02
Test message ID: IT302M03	PRI: FF FT: <FT> OHI: TEST IT302/TC03
Test message ID: IT302M04	PRI: DD FT: <FT> OHI: TEST IT302/TC04
Test message ID: IT302M05	PRI: SS FT: <FT> OHI: TEST IT302/TC05

From UA IUTBMHSA Test message ID: IT501M02	<u>To Primary Recipients:</u> IUTAMHSA and IUTAFTNA PRI: FF FT: <FT> OHI: TEST IT501/TC02
Test message ID: IT501M04	<u>To Primary Recipients:</u> IUTAMHSA and IUTAFTNA <u>To Copy Recipients:</u> IUTAMHSB and IUTAFTNB PRI: FF FT: <FT> OHI: TEST IT501/TC04
Test message ID: IT501M06	<u>To Primary Recipients:</u> IUTAMHSA and IUTAFTNA <u>To Copy Recipients:</u> IUTAMHSB and IUTAFTNB <u>To Blind Copy Recipients:</u> IUTAMHSC and IUTAFTNC PRI: FF FT: <FT> OHI: TEST IT501/TC06
From UA IUTBMHSA Test message ID: IT502M02	To: IUTBDLLO PRI: FF FT: <FT> OHI: TEST IT502/TC02
Test message ID: IT502M04	To: IUTADLRE PRI: FF FT: <FT> OHI: TEST IT502/TC04
From UA IUTBMHSA Test message ID: IT503M02	To: AFTN Terminal IUTAFTNA PRI: FF FT: <FT> OHI: TEST IT503/TC02 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... <63 figure lines 1234567890 ... 123456789> 123456789012345678901234567890123456789012345678901234567890123456789 END

From UA IUTBMHSA Test message ID: IT504M02	To: IUTAFTNA, IUTAFTNB, IUTAFTNC, IUTAFTND, IUTAFTNE, IUTAFTNF, IUTAFTNG, IUTAFTNH, IUTAFTNI, IUTAFTNJ, IUTAFTNK, IUTAFTNL, IUTAFTNM, IUTAFTNN, IUTAFTNO, IUTAFTNP, IUTAFTNQ, IUTAFTNR, IUTAFTNS, IUTAFTNT, IUTAFTNU, IUTAFTNV, IUTAFTNW, IUTAFTNX, IUTAFTNY, IUTAFTAA, IUTAFTAB, IUTAFTAC, IUTAFTAD, IUTAFTAE, IUTAFTAF, IUTAFTAG, IUTAFTAH, IUTAFTAI, IUTAFTAJ, IUTAFTAK, IUTAFTAL, IUTAFTAM, IUTAFTAN, IUTAFTAO, IUTAFTAP, IUTAFTAQ, IUTAFTAR, IUTAFTAS, IUTAFTAT, IUTAFTAU, IUTAFTAV, IUTAFTAW, IUTAFTAX, IUTAFTAY PRI: FF FT: <FT> OHI: TEST IT504/TC02

8.3 Input device AFTN Terminal: IUTBFTNA

From AFTN Terminal IUTBFTNA	to UA IUTAMHSA
Test message ID: IT202M01	KK IUTAMHSA <FT> IUTBFTNA TEST IT202/TC01
Test message ID: IT202M02	GG IUTAMHSA <FT> IUTBFTNA TEST IT202/TC02
Test message ID: IT202M03	FF IUTAMHSA <FT> IUTBFTNA TEST IT202/TC03
Test message ID: IT202M04	DD IUTAMHSA <FT> IUTBFTNA TEST IT202/TC04
Test message ID: IT202M05	SS IUTAMHSA <FT> IUTBFTNA TEST IT202/TC05

From AFTN Terminal IUTBFTNA	to UA IUTAMHSA
Test message ID: IT402M01	KK IUTAFTNA <FT> IUTBFTNA TEST IT402/TC01
Test message ID: IT402M02	GG IUTAFTNA <FT> IUTBFTNA TEST IT402/TC02
Test message ID: IT402M03	FF IUTAFTNA <FT> IUTBFTNA TEST IT402/TC03
Test message ID: IT402M04	DD IUTAFTNA <FT> IUTBFTNA TEST IT402/TC04
Test message ID: IT402M05	SS IUTAFTNA <FT> IUTBFTNA TEST IT402/TC05

8.4 Test message templates for multilateral tests

From UA IUTAMHSA Test message ID: IT701M01	To: IUTBMHSA and IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC01
From UA IUTBMHSA Test message ID: IT701M02	To: IUTAMHSA and IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC02
From UA IUTCMHSA Test message ID: IT701M03	To: IUTAMHSA and IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC03

From UA IUTAMHSA Test message ID: IT702M01	To: IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC01
From UA IUTBMHSA Test message ID: IT702M02	To: IUTAMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC02
From UA IUTCMHSA Test message ID: IT702M03	To: IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC03

From UA IUTAMHSA Test message ID: IT801M01	To: IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC01
From UA IUTBMHSA Test message ID: IT801M02	To: IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC02
From UA IUTCMHSA Test message ID: IT801M03	To: IUTAMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC03

From UA IUTAMHSA Test message ID: IT802M01	To: IUTXMHSA PRI: FF FT: <FT> OHI: TEST IT802/TC01
From UA IUTBMHSA Test message ID: IT802M02	To: IUTXMHSA PRI: FF FT: <FT> OHI: TEST IT802/TC02
From UA IUTCMHSA Test message ID: IT802M03	To: IUTXMHSA PRI: FF FT: <FT> OHI: TEST IT802/TC03

- END -

ANNEX F

AMHS Pre-Operational Tests

ANNEX F

of

AMHS Manual

Document Control Log

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References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [2] ICAO DOC 9705-AN/956: The Manual of technical provisions for the ATN, Sub-volume III, Section 3.1 –Edition 3 (2002) – Referred to as AMHS SARPs
- [3] ASIAPAC AMHS Manual, Main Part
- [4] ASIAPAC AMHS Manual, Appendix C, AMHS Testing Requirements
- [5] ASIAPAC AMHS Manual, Appendix D, AMHS Conformance Tests
- [6] ASIAPAC AMHS Manual, Appendix E, AMHS Interoperability Tests

1 Introduction

1.1 Purpose of the Document

The purpose of the document is to define AMHS Pre-operational Tests in order to ensure the interoperability between AMHS systems prepared for going into operation. The document defines the objectives and prerequisites as well as the tests themselves.

The AMHS Pre-operational Tests are interoperability type tests. They are the last tests between Operational Systems and should be performed within the operational network environment before the "AMHS cut-over".

After "AMHS cut-over" the AMHS relation between the two systems is operational. That means: the exchange of the complete operational traffic (or a part of that) is performed by means of AMHS only. For this traffic no other means (AFTN or X.25) are used.

1.2 Objectives of the Pre-operational Tests

The objectives of the AMHS Pre-operational Tests are:

1. To test the interoperability between the AMHS systems in an operational environment.
2. To test the integrity of the messages exchanged.
3. To test the message exchange after a disturbance (e.g. queued messages).

The prerequisites of the AMHS Pre-operational Tests are:

- Successful performance of AMHS Conformance Tests as specified in [5], through which the compliance of all systems under test to the [2] has been demonstrated, and
- Successful performance of AMHS Interoperability Tests as specified in [6], through which the interoperability of these AMHS systems in a test (bed) environment has been demonstrated, and
- Successful performance of Underlying Network Tests, through which is demonstrated that the underlying (IP) network is available and stable, and
- System configuration on both systems (The agreed set is loaded and established.)

The messages used in the AMHS Pre-operational Tests are generated either:

- manually, or
- using parallel duplicated traffic;

1.3 Test Overview

The following tests have to be performed:

1. Go-NoGo Test: A simple test which checks that the configuration and underlying network functions are operating correctly. It is a prerequisite for the subsequent tests.
2. Traffic duplication and verification: For selected AFTN addressee indicators all traffic₁ will be duplicated to corresponding AMHS recipient addresses on the remote system. On the remote system the AFTN message received will be compared with the copy received by the AMHS user.

3. Stress test: The outgoing AMHS traffic recorded in one day within the previous test is repeated from one to the other system and vice versa. To simulate an outage between the involved systems the LAN connection can be disabled; in consequence the messages are queued. If enough messages are queued the LAN connection will be enabled.
4. (Optional) Selected test cases from the AMHS Interoperability Tests: Due to the fact that in the pre-operational test phase the operational system with the complete operational setup is used, a selection of interoperability tests may be repeated.

The estimated duration of the AMHS Pre-operational Tests is 4 days and calculated as follows:

Test ID	Duration	Remark
PRE001 and PRE002	1 hour	inclusive set-up / co-ordination
PRE003	3 days	
PRE003	0.5 day	
optional (selected Interoperability Tests)	1 hour	

Table F- 1: Estimated duration of the AMHS Pre-operational Tests

¹ Traffic consisting of the locally originated AFTN flow and the incoming AFTN flow; *Locally originated AFTN flow*: national AFTN traffic received by the COM Centre addressed to international (or national) communication partners; *Incoming AFTN flow*: international AFTN traffic received by the COM Centre addressed to international (or national) communication partners.

² Where aaaa = the location indicator of the MTA location of the Test partner 1.

³ Where dddd = the location indicator of the MTA location of the Test partner 2.

1.4 Document Structure

Chapter 1 presents the purpose, objectives and test overview.

Chapter 2 presents the test environment used for AMHS Pre-operational Testing.

Chapter 3 defines the set-up and configuration of the AMHS systems.

Chapter 4 defines the addressing plan for AMHS Pre-operational Testing.

Chapter 5 contains the description of the Pre-operational Tests.

2 AMHS Pre-operational Test Environment

2.1 Application infrastructure

The AMHS systems prepared for going into operation are interconnected by means of the operational infrastructure (cf. Figure F-1).

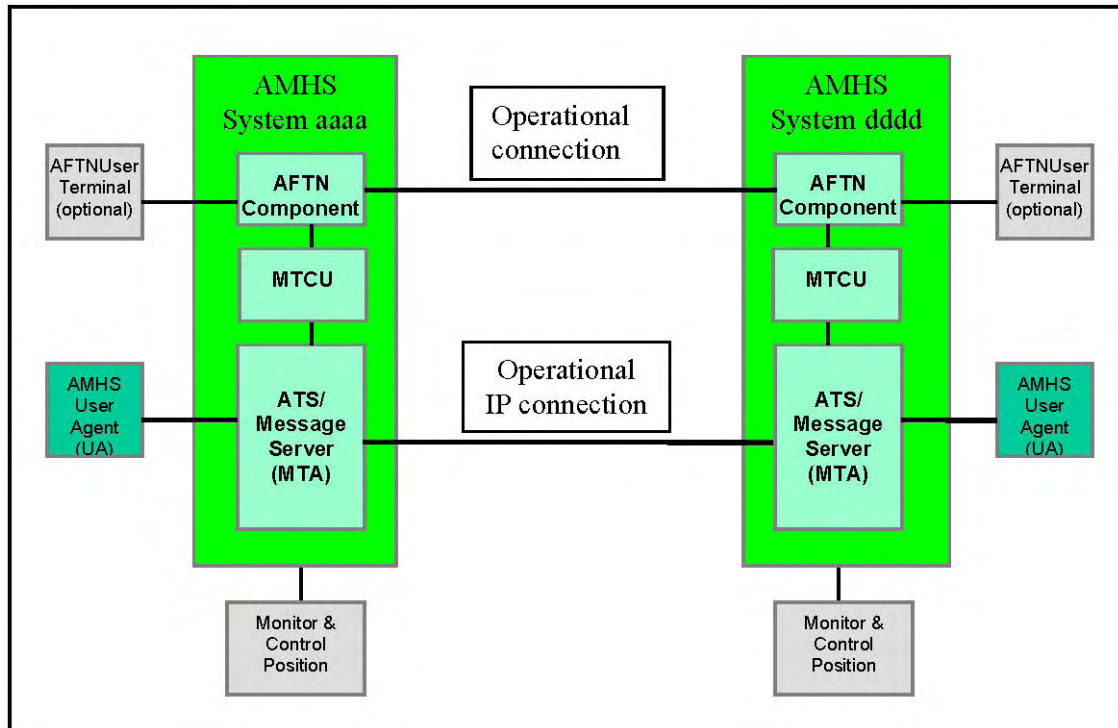


Figure F- 1: AMHS Pre-operational Test Environment

2.2 Transport infrastructure

One of the recommended infrastructures was TCP/IP protocol (IPv4/IPv6). In line with existing recommendations, the operational IP connection should utilize IPv6 at the international level and should provide a redundant connectivity. The redundancy concept of the network ensures the reach ability in any case between the MTAs, while the MTA uses single IP addresses only.

3 Operational system setup - Configuration

The AMHS Systems involved in the pre-operational tests are expected to be configured “as close” to the Operational Systems as possible (with respect to routing tables and look-up tables).

Special addresses needed for testing are listed in this document.

MTA names etc. shall follow the recommendations laid down in [3]. For completeness they are listed hereafter.

3.1 Configuration Lower Layers

Item	Test partner 1	Test partner 2	Recommended values
TSAP	TBD	TBD	e.g. '544350' (“TCP”) or '4D4853' (“MHS”)
IPv6 Address	TBD	TBD	
IP Port	TBD	TBD	102

Table F- 2: Configuration Lower Layers

3.2 Configuration Upper Layers

Item Item	Test partner 1	Test partner 2	Recommended values
MTA Name	MTA-aaaa2-1	MTA-dddd3-1	cf. [3] section 8.2
Password	ICAO-aaaa-1	ICAO-dddd-1	cf. [3] section 8.2
PSAP	not used	not used	not used
SSAP	not used	not used	not used
Number of incoming associations	TBD	TBD	5, should be equal to the outgoing number
Number of outgoing associations	TBD	TBD	5, should be equal to the incoming number
Protocol type	X.400/1988	X.400/1988	cf. PDR M6080001 Phasing out of IPM 1984
Dialogue mode	Monologue	Monologue	

Table F- 3: Configuration Upper Layers

4 Addressing Plan for AMHS Pre-operational Testing

4.1 User addresses

To meet the scope of testing, the test-address space used by AMHS Pre-operational Testing should include for each test partner as minimum one AMHS user.

4.1.1 AMHS Users for Test partner 1

User Name	MF-address	Remarks
aaaaAMHA	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHA	or other than AMHA

Table F- 4: Registered AMHS Users (Test partner 1)

Example:

User Name	MF-address	Remarks
LEEEAMHA	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LEEE /CN=LEEEAMHA	

4.1.2 AMHS Users for Test partner 2

User Name	MF-address	Remarks
ddddAMHA	/C=XX/A=ICAO/P=eeee/O=ffff/OU1=dddd /CN=ddddAMHA	or other than AMHA

Table F- 5: Registered AMHS Users (Test partner 2)

Example:

User Name	MF-address	Remarks
EDDDYFYA	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDYFYA	

4.2 Addresses for Traffic Duplication

Due to the fact that the Pre-operational tests will be performed in an operational environment the addresses selected for duplication cannot be pre-determined in this document. The following tables show two different possibilities how to define these addresses. The test partners have all freedom in definition and selection.

It is recommended to select those addresses for duplication to which a moderate number of messages are usually transmitted.

4.2.1 AFTN Addresses selected for Traffic Duplication -Test partner 1 to Test partner 2

AF Address	O/R address	Remarks
ddaaCOPY	/C=XX/A=ICAO/P=eeee/O=ffff/OU1=ddaa /CN=ddaaCOPY	Copy of a real ddaa address
ddbbCOPY	/C=XX/A=ICAO/P=eeee/O=ffff /OU1=ddbb /CN=ddbbCOPY	Copy of a real ddbb address
ddccCOPY	/C=XX/A=ICAO/P=eeee/O=ffff /OU1=ddcc /CN=ddccCOPY	Copy of a real ddcc address

Table F- 6: AFTN addresses -Test partner 1 to Test partner 2

Example:

AF Address	O/R address	Remarks
LEEECOPY	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LEEE /CN=LEEECOPY	real address: LEEENYX
LEEACOPY	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LEEA /CN=LEEACOPY	real address: LEMMYMYX
LECMCOPY	/C=XX/A=ICAO/P=AENA/O=LECM/OU1=LECM /CN=LECMCOPY	real address: LECMZAZX

4.2.2 AFTN Addresses selected for Traffic Duplication -Test partner 2 to Test partner 1

AF Address	O/R address	Remarks
aaaaAMHA	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHA	Copy of a real aaaa address
aaaaAMHB	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHB	Copy of another real aaaa address
aaccAMHC	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aacc /CN=aaccAMHC	Copy of a real aacc address

Table F- 7: AFTN addresses -Test partner 2 to Test partner 1

Example:

AF Address	O/R address	Remarks
EDDDAMHA	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDAMHA	real address: EDDDYNYX
EDDDAMHB	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDAMHB	real address: EDZOYMYX
EDZZAMHC	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDZZ /CN=EDZZAMHC	real address: EDZZNAXX

4.3 DL addresses

It is recommended to use for DLs specific Common Names (CN) to make it transparent for the users that this special O/R address is related to a Distribution list. The CN of a DL O/R address should in line with the definition for PDAI in [1].

4.4 AFTN and X.400 Routing Tables

It is recommended that the systems involved in the Pre-operational Tests are configured with the latest valid **AFTN Routing Table** available in the AMC system including the minor changes needed for the Pre-operational Tests themselves.

Only for the selected traffic (bilaterally agreed addresses) shall AFTN routing paths through the MTCU be set up.

Furthermore it is recommended that the systems are configured with the **complete X.400**.

Routing Table covering all existing PRMD names. For all PRMD names which are not involved in the Pre-operational Tests, a default routing to a "Dummy MTA direction" shall be defined in order to handle exceptional situations within the Pre-operational Tests as well as for future operations.

Only for the selected traffic (bilaterally agreed addresses) shall respective X.400 routing paths through the MTCU or to the adjacent MTA be set up.

The recommended complete setup of the X.400 Routing table allows the responsible international COM Centre to ensure that each message entered into an international Network (AFTN, X.25 as well as AMHS) is correct in format and addressing. When using a reduced X.400 routing table, (use of general default routing entries), such checking of addressing cannot be performed, especially if domestic UAs are connected. Only with the full set of PRMD routing entries, is a minimum checking of address validity possible.

4.5 Look-up Tables

4.5.1 Generic look-up Tables

It is recommended that the systems are configured with the complete set of information required for the address translation.

The tables needed are reflected in [8] or in the Intra MD Addressing function of the ATS Messaging Management Centre (AMC). From the AMC the complete **MD Look-up Table** (AMHS MD Register Export. csv) and the complete **CAAS Look-up Tables** (CAAS Table .csv) can be downloaded.

Loading of the complete tables is recommended to ensure that the AMHS application is able to handle the extensive content of the tables covering the address translation of all existing AFTN addresses into AMHS O/R addresses (XF as well as CAAS) and vice versa.

4.5.2 User address look-up Table

It is recommended to start Pre-operational tests and operations with empty **User address look-up tables**.

This kind of functionality should be foreseen for exceptional users and situations. Each entry in this table shall be coordinated with the AMC for the Regional and world-wide use.

5 Test Description

5.1 Test Scenarios

The tests are described in the following test scenarios:

PRExxx where xxx is the scenario number.

The following table contains an overview of the test scenarios:

Test-case id	Test function
PRE001	Go-NoGo test Test partner 1 to Test partner 2
PRE002	Go-NoGo test Test partner 2 to Test partner 1
PRE003	Exchange of duplicated Operational messages, check of integrity.
PRE004	Stress / Load Test (queued data)

Table F- 8: Test Scenario overview

5.2 Pre-operational AMHS Tests

This section contains the test-cases. Each test-case is written on a test sheet, which should be completed during testing.

The top of test-sheet contains the **test-case id** and a description of the **tested functionality**.

The **Test description** contains the instructions for the tester, the addresses used and the test message used.

The **Test control** contains the expected reaction/observation of the Systems under Test (SUTs).

The section **Test result** is used to log the test results.

5.2.1 Go-NoGo test (Partner 1 to Test Partner 2)

Test Reference	Tested Functionality
PRE001	This is a simple test with the purpose to check that the configuration and underlying network work correctly. It is a prerequisite for subsequent tests. An FF priority message is sent from Test partner 1 to Test partner2.

Test description:

From aaaaAMHA send the following FF priority message to ddddAMHA:

```
PRE001
123456789012345678901234567890123456789012345678901234567890123456789
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
```

(and so on till)

```
ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Check the correct reception at ddddAMHA and send the following acknowledgement if the message is received correctly.

From ddddAMHA send the following message to aaaaAMHA:

ACK001 PLS CONTINUE WITH PRE002

Test control:

Check the correct reception of the message at ddddAMHA. No difference must exist between the message as defined above and the received message.

Test result:

PASS	FAILED	INCONCLUSIVE

5.2.2 Go-NoGo test Test partner 2 to Test partner 1

Test Reference	Tested Functionality
PRE002	This is a simple test with the purpose to check that the configuration and underlying network work correctly. It is a prerequisite for subsequent tests. An FF priority message is sent from Test partner 2 to Test partner1.

Test description:

From ddddAMHA send the following message to aaaaAMHA:

```
PRE002
12345678901234567890123456789012345678901234567890123456789
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
```

(and so on till)

[illegible]

Check the correct reception at aaaaAMHA and send the following acknowledgement if the message is received correctly.

From aaaaAMHA send the following message to ddddAMHA:

ACK002 PLS CONTINUE WITH PRE003

Test control:

Check the correct reception of the message at aaaaAMHA. No difference must exist between the message as defined above and the received message.

Test result:

PASS	FAILED	INCONCLUSIVE

5.2.3 Duplicated message exchange

Test Reference	Tested Functionality
PRE003	For selected AFTN destination addresses all traffic will be duplicated to corresponding AMHS recipient addresses at the remote system. At the remote system the AFTN messages received will be compared with the copies transmitted via AMHS.

Test description:

- On the system of Test partner 1 enable the duplication of Operational traffic for the agreed AFTN addressee indicators:

The duplication shall remain active for 3 days.

- On the system of Test partner 2 enable the duplication of Operational traffic for agreed AFTN addressee indicators:

The duplication shall remain active for 3 days.

Test control:

Note: Not all details of test control can be defined since two different systems are involved. Therefore the control is done in a general form. The main purpose of this test is to prove the integrity of the message exchange. At the same time, it is possible to detect problems which have not been spotted during previous tests.

- Compare the number of messages received at the AFTN addresses with the number of messages received as copies at the corresponding AMHS addresses (check if all duplicated messages are received).
- Compare the contents of the messages received for one randomly selected hour of traffic per day. The method of comparison is a local matter. Some options are:
 - the messages can be displayed on two screens and compared one by one,
 - the traffic log can be exported and compared (partly) electronically/in an automated way.
- Check the event logging of the system for abnormalities in the area of AMHS/X.400/AFTN/AMHS Gateway.
- Check the event logging / traffic traces for NDRs.

5. Check for Control Position events.
6. Check the X.400/AMHS Diagnostics; check the number of associations used (in particular possible hanging/unused associations).
7. Monitor the underlying network infrastructure (network specialist).

The following table can be used to make notes of the Test Control result:

Test Control	Result
1. Compare the number of messages received as AFTN copy with the number of messages received as AMHS copy.	
2. Compare the contents of the messages.	
3. The messages can be displayed on two screens and compared one by one.	
4. The traffic log can be exported and compared (partly) electronically/in an automated way.	
5. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.	
6. Check whether NDRs have been received or transmitted.	
7. Check for events at the Control Position.	
8. X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).	
9. Monitor the underlying network infrastructure (network specialist).	

The test is failed if messages are lost, duplicated or corrupted. The other observations have to be forwarded to each other in the form of a test log and discussed in a test review.

Test result:

PASS	FAILED	INCONCLUSIVE

5.2.4 Stress / Load Test

Test Reference	Tested Functionality
PRE004	This test is performed to observe the behaviour of both systems during a load/stress situation. The traffic exchanged in test PRE003 is repeated in a burst fashion.

Test description:

1. Disable the duplication of traffic on both sides.
2. Three tests should be run. The amount of messages shall be:
 - 100 for the first test
 - 200 for the second test
 - 400 for the third test
3. Both sides shall retrieve the outgoing AMHS traffic exchanged in PRE003 for an agreed day.
4. Both sides shall inform each other about the amount of messages to be expected.
5. At **Test partner 2** (or 1) interrupt the LAN connection to **Test partner 1** (or 2) by an adequate command (should be agreed between the Test partners).
6. At **Test partner 1** and **Test partner 2** “repeat” the messages retrieved in step 2 and observe a queue with a length as communicated in step 3.
7. The moment to re-connect the LAN is co-ordinated by telephone. Note down the time it takes from re-connecting the LAN till the moment the queues are empty.
8. At **Test partner 2** (or 1) re-establish the LAN connection by adequate means (commands).
9. Observe and notice the incoming and outgoing message flow.

Test control:

1. The number of messages received shall be equal to the number of messages expected.
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.
3. Check the event logging / traffic traces for NDRs.

4. Check for Control Position events.
5. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).
6. Monitor the underlying network infrastructure (network specialist).
7. At both sides note the amount of time needed to flush the queues.

The following table can be used to make notes of the Test Control result.

Test Control	Result		
	100	200	400
1. The number of messages received shall be equal to the number of messages expected.			
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.			
3. Check the event logging / traffic traces for NDRs.			
4. Check for events at the Control Position.			
5. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).			
6. Monitor the underlying network infrastructure (network specialist).			
7. At both sides note the amount of time needed to flush the queues.			

Note: The test is failed if messages are lost, duplicated or corrupted. The other observations have to be forwarded to each other in the form of a test log and discussed in a test review.

Test result:

PASS	FAILED	INCONCLUSIVE

5.2.5 Additional selected and agreed Interoperability Tests

Here the selected and bilaterally agreed Test cases should be listed.

- END -

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA and PACIFIC OFFICE**

**Aeronautical Telecommunication Network
Implementation Coordination Group
(ATNICG)**



Recommended Security Checklist

September 2009

**Prepared by
ATN ICG Security Sub-Group and**

Adopted by APANPIRG/20

Document Revision History

Release	Date	Comment
Draft 1	21 April 2008	Controls from NIST SP 800-53 Identified
Draft 2	25 September 2008	Controls in checklist format
Version 1	4 May 2009	Checklist reduced to policy and essential check item(s) in each control family

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1 Introduction

1.1 Motivation

The Asia/Pacific Region is implementing the Aeronautical Telecommunication Network (ATN) infrastructure in support of the ATN Message Handling Service (AMHS). In order to ensure that security measures are implemented throughout the Asia/Pac ATN, a comprehensive checklist is needed. The ATNIG Security Sub-Group decided at the first sub-group meeting in April 2008 to base the checklist on the list of security controls in National Institute of Standards and Technology (NIST) Special Publication (SP) 800-53 (SP800-53) [1].

This paper aims to provide a set of security controls in the form of a checklist. The goal is to describe each security control in a fashion suitable for an organization to verify that a set of controls sufficient for their operating environment has been implemented in accordance with the Asia/Pacific System Security Policy [2]. This checklist may be used as the basis of an organization's *verification* that their system is implemented with appropriate security measures. With this checklist filled in the organization's Designated Approving Authority (DAA) can provide *authorization* that the system may be placed into operation.

1.2 References

The following documents were used in the preparation of this paper.

- [1] National Institute of Standards and Technology. Special Publication 800-53. Recommended Security Controls for Federal Systems. February 2005. Currently available from: <http://csrc.nist.gov/publications/nistpubs/index.html>.
- [2] Asia/Pacific ATN System Security Policy, 2nd Edition, May 2008

2 Security Control Overview

Table 2-1 is a summary list of the control classes and families. Each control family is classified as a Management, Operational, or Technical Control.

Table 2-1. Security Control Classes and Families

Class	Family	Identifier
Management	Risk Assessment	RA
Management	Planning	PL
Management	System and Services Acquisition	SA
Management	Certification, Accreditation, and Security Assessments	CA
Operational	Personnel Security	PS
Operational	Physical and Environmental Protection	PE
Operational	Contingency Planning	CP
Operational	Configuration Management	CM
Operational	Maintenance	MA
Operational	System and Information Integrity	SI
Operational	Media Protection	MP
Operational	Incident Response	IR
Operational	Awareness and Training	AT
Technical	Identification and Authentication	IA
Technical	Access Control	AC
Technical	Audit and Accountability	AU
Technical	System and Communications Protection	SC

Each family comprises one or more security controls. Each security control is sequentially numbered within the family. The following subsections describe the structure of the security controls and the organization of the security controls into baselines.

3 Catalogue of Security Control Requirements

Table 3-1 identifies the developed security checklist.

The ID column provides the security checklist identifier. It can be used to trace the security checklist item back to its control family. To enable traceability to the security controls, each security checklist item is assigned an identifier based on the identifier of the security control family.

The Security Checklist Text column contains the language for each checklist item.

The Implemented column is where an organization may indicate compliance with the checklist item.

The Comment column provides any additional information noted during the assessment of the particular item.

Table 3-1. Security Checklist

ID	Security Checklist Text	Implemented (Yes/No)	Comment
	ACCESS CONTROL (AC)		CLASS: TECHNICAL
	ACCESS CONTROL POLICY		
AC.1	Does the organization have a formal, documented, access control policy?		
	ACCOUNT MANAGEMENT		
AC.2	Does the organization manage system accounts, including establishing, activating, modifying, reviewing, disabling, and removing accounts?		
	ACCESS ENFORCEMENT		
AC.3	Does the system enforce assigned authorizations for controlling access to the system in accordance with applicable policy?		
	SUPERVISION AND REVIEW — ACCESS CONTROL		
AC.4	Does the organization review the activities of users with respect to the enforcement and usage of system access controls?		
	REMOTE ACCESS		
AC.5	Does the organization document, monitor, and control all methods of remote access (e.g., dial-up, Internet) to the system?		
	AWARENESS AND TRAINING (AT)		CLASS: OPERATIONAL
	SECURITY AWARENESS AND TRAINING POLICY		
AT.1	Does the organization have a formal, documented, security awareness and training policy?		
	SECURITY TRAINING		
AT.2	Does the organization provide basic security awareness training to all users?		
	AUDIT AND ACCOUNTABILITY (AU)		CLASS: TECHNICAL
	AUDIT AND ACCOUNTABILITY POLICY		
AU.1	Does the organization have a formal, documented, audit and accountability policy?		
	AUDITABLE EVENTS		
AU.2	Does the system generate audit records for the significant security events?		
	AUDIT MONITORING, ANALYSIS, AND REPORTING		

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ID	Security Checklist Text	Implemented (Yes/No)	Comment
AU.3	Does the organization regularly review/analyze audit records for indications of inappropriate or unusual activity?		
	CERTIFICATION, ACCREDITATION, AND SECURITY ASSESSMENTS (CA)		CLASS: MANAGEMENT
	CERTIFICATION, ACCREDITATION, AND SECURITY ASSESSMENT POLICY		
CA.1	Does the organization have a formal, documented, security assessment and verification and accreditation policy?		
	SECURITY CERTIFICATION		
CA.2	Does the organization conduct an assessment of the security controls in the system to determine the extent to which the controls are implemented correctly, operating as intended, and producing the desired outcome with respect to meeting the security requirements for the system?		
	SECURITY ACCREDITATION		
CA.3	Does the organization authorize (i.e., accredit) the system for processing before operations?		
	CONFIGURATION MANAGEMENT (CM)		CLASS: OPERATIONAL
	CONFIGURATION MANAGEMENT POLICY		
CM.1	Does the organization have a formal, documented configuration management policy?		
	CONFIGURATION CHANGE CONTROL		
CM.2	Does the organization control changes to the system?		
	CONTINGENCY PLANNING (CP)		CLASS: OPERATIONAL
	CONTINGENCY PLANNING POLICY		
CP.1	Does the organization have a formal, documented contingency planning policy?		
	CONTINGENCY PLAN		
CP.2	Does the organization develop a contingency plan?		
	SYSTEM BACKUP		
CP.3	Does the organization conduct backups of user-level and system-level information?		

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ID	Security Checklist Text	Implemented (Yes/No)	Comment
	IDENTIFICATION AND AUTHENTICATION (IA)		CLASS: TECHNICAL
	IDENTIFICATION AND AUTHENTICATION POLICY		
IA.1	Does the organization have a formal, documented identification and authentication policy?		
	USER IDENTIFICATION AND AUTHENTICATION		
IA.2	Does the system uniquely identify users (or processes acting on behalf of users)?		
IA.3	Does the system authenticate users (or processes acting on behalf of users)?		
	DEVICE IDENTIFICATION AND AUTHENTICATION		
IA.4	Does the system identify specific devices before establishing a connection?		
IA.5	Does the system authenticate specific devices before establishing a connection?		
	INCIDENT RESPONSE (IR)		CLASS: OPERATIONAL
	INCIDENT RESPONSE POLICY		
IR.1	Does the organization have a formal, documented incident response policy?		
	INCIDENT HANDLING		
IR.2	Does the organization implement an incident handling capability for security incidents that includes preparation, detection and analysis, containment, eradication, and recovery?		
	MAINTENANCE (MA)		CLASS: OPERATIONAL
	SYSTEM MAINTENANCE POLICY		
MA.1	Does the organization have a formal, documented system maintenance policy?		
	CONTROLLED MAINTENANCE		
MA.2	Does the organization perform routine preventative and regular maintenance on the components of the system?		
	MEDIA PROTECTION (MP)		CLASS: OPERATIONAL
	MEDIA PROTECTION POLICY		
MP.1	Does the organization have a formal, documented media protection policy?		

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ID	Security Checklist Text	Implemented (Yes/No)	Comment
	MEDIA ACCESS		
MP.2	Does the organization restrict access to system media to authorized individuals?		
	MEDIA STORAGE		
MP.3	Does the organization physically control system media within controlled areas?		
	PHYSICAL AND ENVIRONMENTAL PROTECTION (PE)		CLASS: OPERATIONAL
	PHYSICAL AND ENVIRONMENTAL PROTECTION POLICY		
PE.1	Does the organization have a formal, documented physical and environmental protection policy?		
	PHYSICAL ACCESS CONTROL		
PE.2	Does the organization control all physical access points to facilities containing systems?		
	EMERGENCY POWER		
PE.3	Does the organization provide a short-term uninterruptible power supply to facilitate an orderly shutdown of the system in the event of a primary power source loss?		
	FIRE PROTECTION		
PE.4	Does the organization employ and maintain fire suppression and detection devices/systems that can be activated in the event of a fire?		
	PLANNING (PL)		CLASS: MANAGEMENT
	SECURITY PLANNING POLICY		
PL.1	Does the organization have a formal, documented security planning policy?		
	SYSTEM SECURITY PLAN		
PL.2	Does the organization develop and implement a security plan for the system?		
	PERSONNEL SECURITY (PS)		CLASS: OPERATIONAL
	PERSONNEL SECURITY POLICY		
PS.1	Does the organization have a formal, documented personnel security policy?		
	PERSONNEL SCREENING		

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ID	Security Checklist Text	Implemented (Yes/No)	Comment
PS.2	Does the organization screen individuals requiring access to organizational information and systems?		
	RISK ASSESSMENT (RA)		CLASS: MANAGEMENT
	RISK ASSESSMENT POLICY		
RA.1	Does the organization have a formal, documented risk assessment policy?		
	RISK ASSESSMENT		
RA.2	Does the organization conduct assessments of the risk and magnitude of harm that could result from the unauthorized access, use, disclosure, disruption, modification, or destruction of information and systems that support the operations and assets of the organization?		
	VULNERABILITY SCANNING		
RA.3	Does the organization scan for vulnerabilities in the system?		
	SYSTEM AND SERVICES ACQUISITION (SA)		CLASS: MANAGEMENT
	SYSTEM AND SERVICES ACQUISITION POLICY		
SA.1	Does the organization have a formal, documented system and services acquisition policy?		
	ALLOCATION OF RESOURCES		
SA.2	Does the organization determine, document, and allocate as part of its capital planning and investment control process the resources required to adequately protect the system?		
	SYSTEM AND COMMUNICATIONS PROTECTION (SC)		CLASS: TECHNICAL
	SYSTEM AND COMMUNICATIONS PROTECTION POLICY		
SC.1	Does the organization have a formal, documented system and communications protection policy?		
	DENIAL OF SERVICE PROTECTION		
SC.2	Does the system protect against or limit the effects of denial of service attacks?		
	BOUNDARY PROTECTION		
SC.3	Does the system monitor and control communications at the external boundary of the system and at key internal boundaries within the system?		
	TRANSMISSION INTEGRITY		

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ID	Security Checklist Text	Implemented (Yes/No)	Comment
SC.4	Does the system protect the integrity of transmitted information?		
	TRANSMISSION CONFIDENTIALITY		
SC.5	Does the system protect the confidentiality of transmitted information?		
	CRYPTOGRAPHIC KEY ESTABLISHMENT AND MANAGEMENT		
SC.6	Does the system employ automated mechanisms with supporting procedures or manual procedures for cryptographic key establishment and key management?		
	PUBLIC KEY INFRASTRUCTURE CERTIFICATES		
SC.7	Does the organization develop and implement a certificate policy and certification practice statement for the issuance of public key certificates used in the system?		
	SESSION AUTHENTICITY		
SC.8	Does the system provide mechanisms to protect the authenticity of communications sessions?		
	SYSTEM AND INFORMATION INTEGRITY (SI)		CLASS: OPERATIONAL
	SYSTEM AND INFORMATION INTEGRITY POLICY		
SI.1	Does the organization have a formal, documented system and information integrity policy?		
	FLAW REMEDIATION		
SI.2	Does the organization identify, report, and correct system flaws?		
	MALICIOUS CODE PROTECTION		
SI.3	Does the system implement malicious code protection that includes a capability for automatic updates?		
	SYSTEM MONITORING TOOLS AND TECHNIQUES		
SI.4	Does the organization employ tools and techniques to monitor events on the system, detect attacks, and provide identification of unauthorized use of the system?		
	SECURITY ALERTS AND ADVISORIES		
SI.5	Does the organization receive system security alerts/advisories on a regular basis, issue alerts/advisories to appropriate personnel, and take appropriate actions in response?		
	SOFTWARE AND INFORMATION INTEGRITY		

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ID	Security Checklist Text	Implemented (Yes/No)	Comment
SI.6	Does the system detect and protect against unauthorized changes to software and information?		
	SPAM AND SPYWARE PROTECTION		
SI.7	Does the system implement spam and spyware protection?		

Table CNS 1B

AERONAUTICAL TELECOMMUNICATION NETWORK (ATN) ROUTER PLAN

EXPLANATION OF THE TABLE

Column

1	Administration – the name of the Administration, State or Organization responsible for management of the router
2	Location of Router
3	Type of Router: BBIS - Backbone Boundary Intermediate System BIS - Boundary Intermediate System
4	Type of Interconnection: Inter – Regional Intra – Regional Sub – Regional
5	Interconnection, Connected to router of: name of the location of the correspondent router
6	Link Speed – Speed requirements of the interconnecting link
7	Link Protocol – Protocol requirements for the interconnecting link
8	Target Date of Implementation – date of implementation of the router TBD- To be determined
9	Remarks

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Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
American Samoa	Pago Pago			United States				Intra-domain
Australia	Brisbane			Timor Leste				Intra-domain
		BBIS	Sub-Regional	Fiji	64000 bps	TDB	2010	Not Implemented
		BIS	Sub-Regional	Indonesia	TDB	TDB	TDB	Not Implemented
		BBIS	Intra-Regional	Japan	64000 bps	TDB	2010	Not implemented
				Nauru				Intra-domain
		BIS	Sub-Regional	New Zealand	TDB	TDB	TDB	Not implemented
				Papua New Guinea				Intra-domain
		BBIS	Inter-Regional	South Africa	TDB	TDB	TBD	Not implemented
				Solomon Islands				Intra-domain
				Vanuatu				Intra-domain
	Melbourne	BBIS	Intra-Regional	Singapore	64000 bps	IP SNCDF	2009	Not implemented
		BBIS	Inter-Regional	United States	64000 bps	TDB	2010	Not implemented
Bangladesh	Dhaka	BIS	Sub-Regional	India	9600 bps	X.25	2010-2011	(India)
		BIS	Sub-Regional	Thailand	9600 bps	X.25	2010-2011	(Thailand)
Bhutan	Paro	BIS	Sub-Regional	India	9600 bps	X.25	TBD	(India)
Brunei Darussalam	Brunei	BIS	Sub-Regional	Malaysia	64000 bps	X.25	2010	(Malaysia)
		BIS	Sub-Regional	Singapore	9600 bps	X.25	2010	(Singapore)
Cambodia	Phnom Penh	BIS	Sub-Regional	Thailand	9600 bps	X.25	2009-2010	(Thailand)

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
China	Beijing	BIS	Sub-Regional	DPR Korea	9600 bps	X.25	2010	ATN Router Implemented
		BBIS	Intra-Regional	Hong Kong, China	64000 bps	X.25	2009	ATN Router Implemented
		BBIS	Intra-Regional	India	64000 bps	X.25	2009	ATM Router Implemented
		BBIS	Intra-Regional	Japan	64000 bps	X.25	2010	ATN Router Implemented
		BBIS	Inter-Regional	Kuwait	64000 bps	X.25	TBD	ATN Router Implemented
		BIS	Sub-Regional	Macau, China	9600 bps	X.25	2009	ATN Router Implemented
		BIS	Sub-Regional	Mongolia	9600 bps	X.25	2010	ATN Router Implemented
		BIS	Sub-Regional	Myanmar	9600 bps	X.25	2010	ATN Router Implemented
		BIS	Sub-Regional	Nepal	9600 bps	X.25	2010	ATN Router Implemented
		BIS	Sub-Regional	Pakistan	9600 bps	X.25	2010	ATN Router Implemented
		BIS	Sub-Regional	Republic of Korea	64000 bps	X.25	2011	ATN Router Implemented
		BBIS	Inter-Regional	Russian Federation	19200 bps	X.25	TBD	ATN Router Implemented
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	2009	ATN Router Implemented
		BIS	Sub-Regional	Vietnam			TBD	(Vietnam)
	Taibei	BIS	Sub-Regional	Hong Kong, China	9600 bps	X.25	2009	
		BIS	Sub-Regional	Japan	9600 bps	X.25	2009	
Hong Kong, China	Hong Kong	BBIS	Intra-Regional	China	64000 bps	X.25	2009	
		BIS	Sub-Regional	Macau, China	9600 bps	X.25	2009	
		BBIS	Intra-Regional	Japan	64000 bps	X.25	2010	
		BIS	Sub-Regional	Philippines	9600 bps	X.25	2009	
		BIS	Sub-Regional	Taibei	9600 bps	X.25	2009	
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	Implemented	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	2010	
Macau, China	Macau	BIS	Sub-Regional	China	9600 bps	X.25	2009	
		BIS	Sub-Regional	Hong Kong, China	9600 bps	X.25	2009	
Cook Islands	Rarotonga			New Zealand	9600 bps	X.25		Intra-domain
DPR Korea	Pyongyang	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
Fiji	Nadi	BBIS	Intra-Regional	Australia	64000 bps	X.25	2010	Circuit implemented
				Kiribati		VPN	2011	Intra-domain
		BIS	Sub-Regional	New Caledonia		TBD	TBD	Intra-domain
				Tuvalu		VPN	2011	Intra-domain
		BBIS	Inter-Regional	United States	64000 bps	X.25	2010	Circuit implemented
				Wallis Islands		TBD	TBD	Intra-domain
French Polynesia	Papeete			New Zealand			TBD	Intra-domain
India	Mumbai	BIS	Sub-Regional	Bangladesh	9600 bps	X.25	TBD	
		BIS	Sub-Regional	Bhutan	9600 bps	X.25	TBD	
		BBIS	Intra-Regional	China	64000 bps	X.25	2010	
		BIS	Inter-Regional	Kenya	19200 bps	X.25	TBD	
		BIS	Sub-Regional	Nepal	9600 bps	X.25	TBD	
		BIS	Inter-Regional	Oman	19200 bps	X.25	TBD	
		BIS	Sub-Regional	Pakistan	9600 bps	X.25	TBD	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BBIS	Intra-Regional	Singapore	64000 bps	X.25	2010	
		BIS	Sub-Regional	Sri Lanka	9600 bps	X.25	TBD	
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	2010	
Indonesia	Jakarta	BIS	Sub-Regional	Australia	9600 bps	X.25	2010	
		BIS	Sub-Regional	Singapore	9600 bps	X.25	2009	
Japan	Tokyo	BBIS	Intra-Regional	Australia	64000 bps	X.25	2010	
		BBIS	Intra-Regional	China	64000 bps	X.25	2010	
		BBIS	Intra-Regional	Hong Kong, China	64000 bps	X.25	2010	
		BBIS	Inter-Regional	Europe	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Republic of Korea	64000 bps	X.25	2011	
		BBIS	Inter-Regional	Russia Federation	64000 bps	X.25	TBD	
		BBIS	Intra-Regional	Singapore	64000 bps	X.25	2010	
		BIS	Sub-Regional	Taipei	64000 bps	X.25	2008	Circuit Implemented
		BBIS	Inter-Regional	United States	64000 bps	X.25	Implemented	
Kiribati	Tarawa	BIS	Sub-Regional	Fiji	9600 bps	X.25	TBD	Intra-domain
Lao PDR	Vientiane	BIS	Sub-Regional	Thailand	9600 bps	X.25	2009-2010	(Thailand)
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	2010	(Vietnam)
Malaysia	Kuala Lumpur	BIS	Sub-Regional	Brunei	64000 bps	X.25	TBD	
		BIS	Sub-Regional	Singapore	64000 bps	X.25	2007	Implemented
		BIS	Sub-Regional	Thailand	64000 bps	X.25	2009	

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Micronesia Federated State of	Chuuk			United States				Intra-domain
	Kosrae			United States				Intra-domain
	Ponapei			United States				Intra-domain
	Yap			United States				Intra-domain
Mongolia	Ulaanbaatar	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
Myanmar	Yangon	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
		BIS	Sub-Regional	Thailand	9600 bps	X.25	2009-2010	(Thailand)
Nauru	Nauru			Australia				Intra-domain
Nepal	Kathmandu	BIS	Sub-Regional	China	9600bps	X.25	2010	(China)
		BIS	Sub-Regional	India	9600bps	X.25	TBD	(India)
New Caledonia	Noumea			Fiji			TBD	Intra-domain
New Zealand	Christchurch	BIS	Sub-Regional	Australia	9600 bps	X.25	2011	
				Cook Is				Intra-domain
				French Polynesia	9600 bps	X.25	TBD	Intra-domain
				Niue	9600 bps	X.25		Intra-domain
				Samoa	9600 bps	X.25		Intra-domain
				Tonga	9600 bps	X.25		Intra-domain
		BIS	Inter-Regional	USA	9600 bps	X.25	2011	
Niue Islands	Niue			New Zealand	9600 bps	X.25		Intra-domain

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Pakistan	Karachi	BIS	Sub-Regional	China	9600 bps	X.25	2010	(China)
		BIS	Sub-Regional	India	9600 bps	X.25	TBD	(India)
Papua New Guinea	Port Moresby			Australia				Intra-domain
Philippines	Manila	BIS	Sub-Regional	Hong Kong, China	9600 bps	X.25	2009	Circuit Implemented
		BIS	Sub-Regional	Singapore	32000 bps	X.25	2009	Circuit Implemented
Republic of Korea	Seoul	BIS	Sub-Regional	China	64000 bps	X.25	2011	
		BIS	Sub-Regional	Japan	64000 bps	X.25	2011	
Samoa	Faleolo			New Zealand				Intra-domain
Singapore	Singapore	BBIS	Intra-Regional	Australia	64000 bps	X.25	2009	Circuit Implemented
		BIS	Inter-Regional	Bahrain	64000 bps	X.25	TBD	Circuit Implemented
		BIS	Sub-Regional	Brunei	9600 bps	X.25	TBD	Circuit Implemented
		BBIS	Intra-Regional	India	64000 bps	X.25	2009	Circuit being implemented
		BIS	Sub-Regional	Indonesia	9600 bps	X.25	2008-2009	Circuit Implemented
		BBIS	Intra-Regional	Japan	64000 bps	X.25	2010	Circuit Implemented
		BIS	Sub-Regional	Malaysia	64000 bps	X.25	2007	Circuit Implemented
		BIS	Sub-Regional	Philippines	32000 bps	X.25	2009-1010	Circuit Implemented
		BIS	Sub-Regional	Sri Lanka	64000 bps	X.25	2010	Circuit Implemented
		BBIS	Intra-Regional	Thailand	64000 bps	X.25	2009-2010	Circuit Implemented
		BBIS	Inter-Regional	United Kingdom	64000 bps	X.25	2009	Circuit Implemented
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	2010-2011	Circuit Implemented

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
Solomon Islands	Honiara			Australia	VPN		2008	(Australia) Intra-Domain
Sri Lanka	Colombo	BIS	Sub-Regional	India	64000 bps	X.25	2010	
		BIS	Sub-Regional	Maldives	64000bps	X.25	2010	
		BIS	Sub-Regional	Singapore	64000 bps	X.25	2010	
Thailand	Bangkok	BIS	Sub-Regional	Bangladesh	9600 bps	X.25	2009-2010	
		BIS	Sub-Regional	Cambodia	9600 bps	X.25	2009-2010	
		BBIS	Intra-Regional	China	64000 bps	X.25	2009	
		BBIS	Intra-Regional	Hong Kong, China	64000 bps	X.25	Implemented	
		BBIS	Intra-Regional	India	64000 bps	X.25	2009-2010	Circuit Implemented
		BBIS	Inter-Regional	Italy	64000 bps	X.25	TBD	Circuit Implemented
		BIS	Sub-Regional	Lao PDR	9600 bps	X.25	2009-2010	
		BIS	Sub-Regional	Malaysia	64000 bps	X.25	2009-2010	
		BIS	Sub-Regional	Myanmar	9600 bps	X.25	2009-2010	
		BBIS	Intra-Regional	Singapore	64000 bps	X.25	2009-2010	Circuit Implemented
		BIS	Sub-Regional	Viet Nam	9600 bps	X.25	2009-2010	
Timor Leste	Dili			Australia				Intra-domain
Tonga	Tongatapu			New Zealand	9600 bps	X.25		Intra-domain
Tuvalu	Funafuti			Fiji			TBD	Intra-domain
United States	Salt Lake City	BBIS	Inter-Regional	Australia	64000 bps	X.25	2010	Circuit Implemented
				American Samoa				Intra-domain

Administration	Location of Router	Type of Router	Type of Interconnection	Interconnection, Connected to router of:	Link Speed	Link Protocol	Target date of Implementation	Remarks
1	2	3	4	5	6	7	8	9
		BBIS	Inter-Regional	Fiji	19200 bps	X.25	2010	Circuit Implemented
		BBIS	Inter-Regional	Japan	64000 bps	X.25	2006	Circuit Implemented
				Marshall Islands				Intra-domain
				Micronesia, Federated State of				Intra-domain
		BIS	Inter-Regional	New Zealand	9600 bps	X.25	2010	Circuit Implemented
				Palau	9600 bps	X.25	2010	Intra-domain
Vanuatu	Port Vila			Australia	VPN		2008	Intra-domain (Australia)
Viet Nam	Ho Chin Minh/Hanoi	BIS	Sub-Regional	China			TBD	
		BIS	Sub-Regional	Hong Kong, China	9600bps	X.25	2010	
		BIS	Sub-Regional	Lao PDR	9600bps	X.25	2010	
		BIS	Sub-Regional	Singapore	9600bps	X.25	2010	
		BIS	Sub-Regional	Thailand	9600bps	X.25	2010	
Wallis Islands	Wallis			Fiji		X.25	TBD	Intra-domain

Table CNS 1C

AMHS ROUTING PLAN

EXPLANATION OF THE TABLE

Column

1	Administration – the name of the Administration, State or Organization responsible for management of the facility
2	Location of Facility
3	Facility Type: AMHS UA (Location of AMHS)
4	Target Date of Implementation – date of implementation of the ATSMHS TBD – To be determined
5	Remarks

Note. - AMHS – ATS Message Handling System which may include Message Transfer Agents and AFTN/AMHS gateways services.

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Appendix G to the Report on Agenda Item 3.4

Administration	Location of Facility	Facility Type	Target Date of Implementation	Remarks
American Samoa	Pago Pago	UA (Salt Lake City)	2010	
Australia	Brisbane	AMHS	2006	
Bangladesh	Dhaka	AMHS	2011	
Bhutan	Paro	UA (Mumbai)	2010	
Brunei Darussalam	Brunei	AMHS	2010	
Cambodia	Phnom Penh	AMHS	2010	
China	Beijing	AMHS	2010	Implemented
	Taipei	AMHS	2010	
Hong Kong, China	Hong Kong	AMHS	2009	
Macau, China	Macau	AMHS	2009	Implemented
Cook Island	Rarotonga	UA (Christchurch)	2010	
DPR Korea	Pyongyang	AMHS	2010	
Fiji	Nadi	AMHS	2010	
French Polynesia	Papeete	AMHS	TBD	
India	Mumbai	AMHS	2010	
Indonesia	Jakarta	AMHS	2009	
	Ujung Pandang	AMHS	2010	
Japan	Fukoka	AMHS	Implemented	
Kiribati	Tarawa	UA (Nadi)	2011	
Lao PDR	Vientiane	AMHS	2010	
Malaysia	Kuala Lumpur	AMHS	2011	
Maldives	Male	AMHS	2010	

Appendix G to the Report on Agenda Item 3.4

Administration	Location of Facility	Facility Type	Target Date of Implementation	Remarks
Marshall Island	Majuro	UA (Salt Lake City)	2010	
Micronesia Federated State of	Chuuk	UA (Salt Lake City)	2010	
	Kosrai	UA (Salt Lake City)	2010	
	Ponapei	UA (Salt Lake City)	2010	
	Yap	UA (Salt Lake City)	2010	
Mongolia	Ulaanbaatar	AMHS	2010	
Myanmar	Yangon	AMHS	2010	
Nauru	Nauru	UA (Brisbane)	2010	
Nepal	Kathmandu	AMHS	2010	
New Caledonia	Noumea	AMHS	TBD	
New Zealand	Christchurch	AMHS	2011	
Niue Is	Niue	UA (Christchurch)	2010	
Pakistan	Karachi	AMHS	2010	
Palau	Koror	UA (Salt Lake City)	2010	
Papua New Guinea	Port Moresby	UA (Brisbane)	2010	
Philippines	Manila	AMHS	2010	Implemented
Republic of Korea	Seoul	AMHS	2011	
Samoa	Faleolo	UA (Christchurch)	2010	
Singapore	Singapore	AMHS	2010	Implemented
Solomon Is	Honiara	UA (Brisbane)	2010	
Sri Lanka	Colombo	AMHS	2010	
Thailand	Bangkok	AMHS	2010	
Timor Leste	Dili	UA (Brisbane)	2010	

Appendix G to the Report on Agenda Item 3.4

Administration	Location of Facility	Facility Type	Target Date of Implementation	Remarks
Tonga	Tongatapu	UA (Christchurch)	2010	
Tuvalu	Funafuti	UA (Nadi)	2011	
United States	Salt Lake City	AMHS	Implemented	
Vanuatu	Port Vila	UA (Brisbane)	2010	
Viet Nam	Ho Chi Minh	AMHS	2012	2010 for Test, 2012 for deployment
Wallis Is.	Wallis	AMHS	TBD	

ASIA/PAC FASID

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TABLE CNS 1E
ATS INTER-FACILITY DATA COMMUNICATION (AIDC)
IMPLEMENTATION PLAN

Explanation of the Table

Column

- 1 State/Administration – the name of the State/Administration;
- 2 Location of AIDC end system – the location of the AIDC end system under the supervision of State/Administration identified in column 1;
- 3 AIDC Pair – the correspondent AIDC end system;

 Location – location of the correspondent AIDC end system

 State/Administration – the name of the State/Administration responsible for management of the correspondent AIDC end system
- 4 AIDC standard used – the AIDC standard adopted for the AIDC connection between the corresponding AIDC pair, AFTN, AFTN/AMHS or ATN;
- 5 Target Date of Implementation – date of implementation of the AIDC end system;
- 6 Remarks – any additional information describing the AIDC end system or the AIDC service between the corresponding AIDC pair.

TABLE CNS 1E
ATS INTERFACILITY DATA COMMUNICATION (AIDC) ROUTING PLAN

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
AUSTRALIA	Brisbane ACC	Oakland ARTCC	USA	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Auckland ACC	New Zealand	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Melbourne	Australia	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
		Makassar ACC	Indonesia	AFTN	2010	ICD V.2.0
				AFTN/AMHS	TBD	
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
	Melbourne ACC	Brisbane ACC	Australia	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	TBD	
BANGLADESH	Dhaka ACC	Kolkata ACC	India	AFTN	Implemented	
		Yangon ACC	Myanmar	AFTN/AMHS	2011	Subject to concurrence with Myanmar
BHUTAN						
BRUNEI DARUSSALAM			Not Required			
CAMBODIA	Phnom Penh ACC	Bangkok ACC	Thailand	AFTN	2010	
CHINA	Beijing ACC	Incheon ACC	Republic of Korea	AFTN	TBD	
	Sanya ACC	Hong Kong ACC	Hong Kong, China	AFTN	Implemented	
		Ho Chi Minh ACC	Vietnam	AFTN	TBD	
	Guangzhou ACC	Hong Kong ACC	Hong Kong, China	AFTN	TBD	
	Taibei ACC	Hong Kong ACC	China	TBD	2012	
	Shanghai ACC	Fukuoka ATMC	Japan	TBD	TBD	

TABLE CNS 1E
ATS INTERFACILITY DATA COMMUNICATION (AIDC) ROUTING PLAN

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
HONG KONG, CHINA	Hong Kong ACC	Guangzhou ACC	China	AFTN	TBD	
		Sanya ACC	China	AFTN	Implemented	
		Manila ACC	Philippines	AMHS	TBD	
		Taipei ACC	China	TBD	2012	
MACAO, CHINA						
COOK ISLANDS						
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA						
FIJI	Nadi ACC	Auckland ACC	New Zealand	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
		Brisbane ACC	Australia	AFTN	Implemented	ICD V. 1.0
				AFTN/AMHS	2010	
		Oakland ARTCC	USA	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
FRANCE						
<i>French Polynesia</i>	Papeete ACC	Auckland ACC	New Zealand	AFTN	Implemented	ICD V. 2.0
<i>New Caledonia</i>						
INDIA	Kolkata ACC	Dhaka ACC	Bangladesh	AFTN	TBD	Subject to co-ordination between Administrations
	Mumbai ACC	Karachi ACC	Pakistan	AFTN	TBD	
				AFTN/AMHS	TBD	
INDONESIA	Jakarta ACC	Melbourne	Australia	AFTN/AMHS	TBD	ICD V.1.0
	Makassar ACC	Brisbane ACC	Australia	AFTN	2010	
				AFTN/AMHS	TBD	

TABLE CNS 1E
ATS INTERFACILITY DATA COMMUNICATION (AIDC) ROUTING PLAN

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
JAPAN	Fukuoka ATMC	Anchorage ACC	USA	AFTN	Implemented	ICD V.1.0
		Incheon ACC	Republic of Korea	AFTN	2009	
		Oakland ARTCC	USA	AFTN	Implemented	
		Taipei ACC	Taipei, China	AFTN	2012	ICD V.3.0
KIRIBATI						
LAO PEOPLE'S DEMOCRATIC	Vientiane ACC	Bangkok ACC	Thailand	AFTN	2010	
MALAYSIA	Kuala Lumpur ACC	Bangkok ACC	Thailand	AFTN	2010	TBD
		Singapore	Singapore	AFTN	2011	
		Kota Kinabalu	Manila	AFTN	2011	
		Kota Kinabalu	Ujung Padang	AFTN	2011	
MALDIVES	Male ACC	Colombo ACC	Sri Lanka	AFTN	2010	
MARSHALL ISLANDS						
MICRONESIA (FEDERATED STATE OF)						
MONGOLIA						
MYANMAR	Yangon ACC	Bangkok ACC	Thailand	AFTN	2010	ICD V.1.0
		Dhaka ACC	Bangladesh	AFTN	2011	
NEPAL	Kathmandu ACC	Kolkata ACC	India	AFTN	2010	
				AFTN/AMHS		
		Banaras ACC	India	AFTN	2010	
				AFTN/AMHS		
		Lhasa ACC	China	AFTN	2010	
			AFTN/AMHS			

TABLE CNS 1E
ATS INTERFACILITY DATA COMMUNICATION (AIDC) ROUTING PLAN

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
NAURU	Brisbane ACC	Oakland ARTCC	USA	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	TBD	
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
NEW ZEALAND	Auckland ACC	Brisbane ACC	Australia	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.1.0
				AFTN/AMHS	2010	
		Oakland ARTCC	USA	AFTN	Implemented	ICD V.2.0
				AFTN/AMHS	2010	
		Papeete ACC	French Polynesia	AFTN	Implemented	ICD V.2.0
PAKISTAN	Karachi	Kuwait	Kuwait	AFTN	TBD	Subject to concurrence of Kuwait
				AFTN/AMHS	TBD	
		Mumbai	India	AFTN	TBD	
				AFTN/AMHS	TBD	
PALAU						
PAPUA NEW GUINEA						
PHILIPPINES	Manila ACC	Hong Kong ACC	Hong Kong, China	AMHS	TBD	
		Singapore ACC	Singapore	AMHS	2011	
		Taipei	Taipei, China	AMHS	2011	
		Makassar A CC	Indonesia	TBD	2011	
		Ho Chi Minh ACC	Viet Nam	TBD	2011	
		Oakland ARTCC	USA	TBD	2011	

TABLE CNS 1E
ATS INTERFACILITY DATA COMMUNICATION (AIDC) ROUTING PLAN

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
REPUBLIC OF KOREA	Incheon ACC	Fukoka ATMC	Japan	AFTN	2009	ICD V.1.0
		Beijing	China	AFTN	TBD	
SAMOA						
SINGAPORE	Singapore ACC	Ho Chi Minh ACC	Vietnam	AFTN/AMHS	2011	ICD Version 3.0 Subject to concurrence from States
				ATN	2012	
		Manila ACC	Philippines	AFTN/AMHS	2011	
				ATN	2012	
		Jakarta ACC	Indonesia	AFTN/AMHS	2011	
				ATN	2012	
		Kuala Lumpur ACC	Malaysia	AFTN/AMHS	2011	
				ATN	2012	
		Kota Kinabalu ACC	Malaysia	AFTN/AMHS	2011	
				ATN	2012	
SOLOM ISLANDS						
SRI LANKA	Colombo ACC	Male ACC	Maldives	AFTN	2010	
TIMOR LASTE						
THAILAND	Bangkok ACC	Hochiminh ACC	Viet Nam	AFTN	2010	
		Kuala Lumpur ACC	Malaysia	AFTN	2010	
		Phnom Penh ACC	Cambodia	AFTN	2010	
		Vientiane ACC	Lao PDR	AFTN	2010	
		Yangon ACC	Myanmar	AFTN	2010	

TABLE CNS 1E
ATS INTERFACILITY DATA COMMUNICATION (AIDC) ROUTING PLAN

State/Administration	Location of AIDC end system	AIDC Pair		AIDC standard used	Target date of Implementation	Remarks
		Correspondent location	Correspondent State/Administration			
1	2	3		4	5	6
TONGA						
UNITED STATES	Oakland ARTCC	Auckland ACC	New Zealand	AFTN	Implemented	ICD V.2.0
		Fukuoka ATMC	Japan	AFTN	Implemented	ICD V.1.0
		Nadi ACC	Fiji	AFTN	Implemented	ICD V.1.0
		Brisbane ACC	Australia	AFTN	Implemented	ICD V.1.0
	Anchorage ARTCC	Fukuoka ATMC	Japan	AFTN	Implemented	ICD V.1.0
VIET NAM	Ho Chi Minh ACC	Sanya ACC	China	AFTN/AMHS	TBD	
		Pnom Penh ACC	Cambodia	AFTN/AMHS	TBD	Subject to Concurrence from Cambodia
		Vientiane ACC	Lao PDR	AFTN/AMHS	TBD	Subject to Concurrence from Lao PDR
	Ho Chi Minh ACC	Singapore ACC	Singapore	AFTN/AMHS	2011	Subject to concurrence from Singapore
		Manila	Philippines	TBD	2011	Subject to concurrence from Philippines
		Bangkok ACC	Thailand	AFTN	2010	



International Civil Aviation Organization
Asia and Pacific Office

FREQUENCY ASSIGNMENT PLANNING CRITERIA FOR VDL

September 2009

Frequency planning for VDL

1 Frequency assignment planning criteria for VDL Mode s 2 and 4 have already been agreed in the Aeronautical Communications Panel. (Re. Report ACP WG M 12 <http://www.icao.int/anb/panels/acp/wgdoclist.cfm?MeetingID=242>)

2 The following material is proposed to be added to the frequency assignment planning criteria in the APAC Region for the VHF COM band for VDL frequency assignment planning.

3 Co-channel separation.

3.1 Co-channel separation between VDL and DSB-AM assignments as well as between VDL Mode 4 and VDL Mode 4 is based on a desired to undesired signal protection ratio of 20 dB (line of sight).

3.2 Adjacent channel separation between VDL and DSB-AM systems in the same geographical area is in accordance with the following table:

Vs.		Interference source		
		DSB-AM	VDL 2	VDL 4
Victim	DSB-AM		1	2
	VDL 2	1	1	1
	VDL 4	2	1	1

Table 4. 25 kHz guard channels between DSB-AM, VDL mode 2 and VDL mode 4

Note: The number in Table 4 are guard channels. The next channel that can be used without and frequency planning constrain is 1 higher (e.g. a desired DSB-AM station that is interfered by a VDL Mode 2 aircraft station requires one 25 kHz guard band channel. The next channel, 50 kHz away can be used in the same designated operational coverage without any frequency assignment planning constraint.

3.3. Attention is drawn to the possibility of interference between DSB-AM and VDL Mode 2/4 when these systems are used on the surface of an airport. Interference can occur if the channel separation (guard band) is four or less. In this case interference between aircraft stations can be prevented through securing that the minimum field strength of these systems is 70 dBm at the antenna. Any interference that may be caused in ground based receiving stations (i.e. not aircraft stations) can be mitigated through using cavity filters that block in these receivers the reception of unwanted signals from transmissions from aircraft operating on the surface of an airport.

RNAV HUMAN FACTORS AND SYSTEMS SAFETY

(Cranfield University Human Factors Report)

SUMMARY

In late 2008, a New Zealand operator commissioned Cranfield University to carry out an RNAV operational safety assessment. The report of the assessment identified a number of safety issues; some of the findings are specific to the aircraft type in the study but many are generic to RNAV systems and operations. This paper summarises the study findings and the significant lessons learned.

1. INTRODUCTION

1.1 The Cranfield University was commissioned to carry out an RNAV operations safety assessment by a New Zealand operator flying a fleet of medium weight turboprop aircraft. The assessment carried out surveys and interviews with crews, observed operations in the cockpit and carried out simulator exercises. As a result of the observations made and the simulator exercises, a number of safety significant findings were made; this paper presents a summary of the findings since there are lessons for all in the study.

1.2 A few of the items identified in the report have been known for a long time but have slipped out of view; this report is a reminder that lessons learned long ago are still valid. The report makes a pertinent observation about accident theories such as the Domino theory and James Reason's Swiss Cheese analogy; both of these are extensions of Murphy's Law – if it can happen, it will happen.

1.3 Dr Steve Jarvis is the author of the Cranfield University Human Factors report upon which this paper is based.

2. DISCUSSION

2.1 The study carried out focused on the human factors aspects of RNAV operations. To this extent the report identifies issues that are related directly to the crew and to aircraft installation issues that affect crew performance. The principal findings are reviewed below.

3. AIRCRAFT INSTALLATIONS

3.1 FMS usability raised a number of issues in that the architecture of the system means that errors are likely to be made. A point is made about the method of selecting an arrival runway where the crew have to enter a number to make the selection rather than selecting the required runway with a line select key. Entering codes to make selection requires the crew to verbalise the code to transfer it to the keypad. This creates a high risk that an error will be made because of other cockpit activity. FMS operations and the method of making selections is a human factors problem that needs to be addressed with the manufacturers.

3.2 The location of the FMS CDU came in for a lot of comment. In the aircraft, the FMS CDU is located in the forward left centre pedestal. This location gives rise to a number of issues, particularly for First Officers (FO).

3.3 To access the FMS CDU, the large angles involved make operating the system difficult through parallax, dexterity, and the angle of force transfer to the keypad. This out of normal reach installation makes operating errors more likely. A further problem is the likelihood of unintentional operation of the power levers.

3.4 Reading the FMS display could be very difficult, particularly in bright sunlight. In bright sunlight the display was often unreadable; Figure 1 shows the FMS as it often appeared to the FO. The result of this is that the monitoring task becomes difficult and is discouraged. When the FO is the pilot flying, it is very difficult to monitor the FMS.

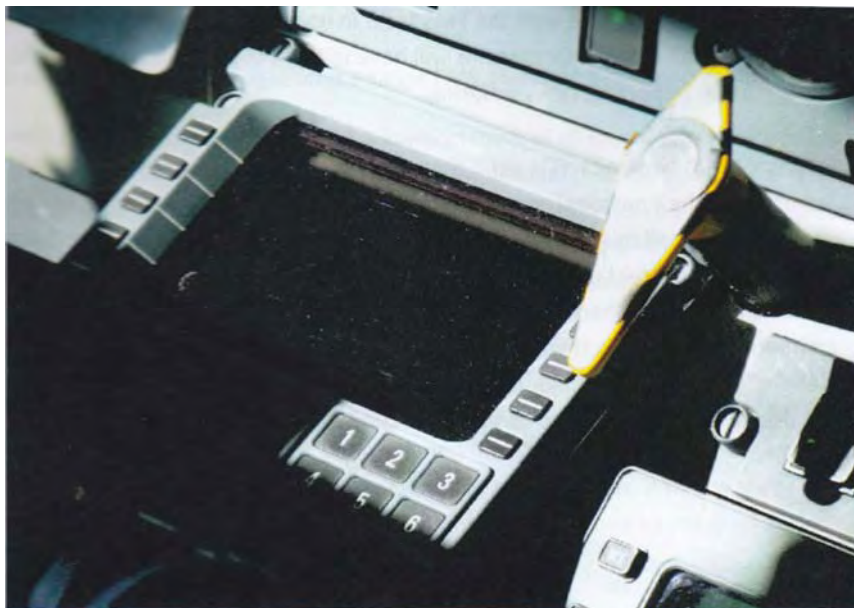


Figure 1: FMS Display in Sunlight.

3.5 The location of the FMS CDU discouraged FOs from using the system since it was not located in their personal space, resulting in a lack of practice. When the FMS CDU is located in the crew member's personal space, they will be more relaxed so are more likely to work more methodically and practice with the unit and take their time. If a mistake is made, they will go back and try again. Routine use significantly improves the competence and confidence of the crew in operating the system.

3.6 Further, the location of the FMS CDU led to FOs asking the Captain to operate the FMS when they were pilot flying. This increased the workload of the pilot monitoring and distracted him / her from the monitoring task.

3.7 The report also criticises the FMS Message system. The most significant problem with the message system was that there was no priority indication for messages. In the simulator exercise, important messages were either missed or ignored since there was no indication as to the importance of the message. When the Message light illuminated, there were indications that crews assumed it was an expected routine message so gave it a low priority. Within the system, there is a need for message priority indications so that crew respond to those of high priority.

3.8 When the autopilot was disconnected, the alert tone was the same as when the autopilot self disconnected. Since the disconnect tone is commonly heard in the cockpit, when the autopilot self disconnects and the tone sounds routine, there is no incentive for the crew to check that it is a pilot who has disconnected it. The recommendation is that the pilot disconnect tone for the autopilot should be different to an automatic disconnect (drop-out) by the autopilot system.

4. CREW FINDINGS

4.1 Many of the crew findings are the result of the simulator exercises carried out. In the simulator, a crew workload measurement system was installed to measure the workload of the crew. This was accomplished by a light on the glare-shield illuminating and requiring the crew to select one of five buttons indicating the perceived workload at the time. For most of the simulator exercises, the average crew workload perceptions were in the normal to busy range but during the go around with the failed FMS, the workload perceptions were in the heavy to extreme (incapacitated) range. There was a general correlation between the Captain / First officer and Pilot flying and pilot monitoring i.e. the trends for both were similar.

4.2 The simulator details consisted of flying a sector from Wellington to Blenheim (Woodbourne) twice in IMC. On one sector there were no failures induced but a weather related go around was required; this sector was a control for the experiment. On the other sector flight, faults were induced. For the RNAV portion of the flight, the fault induced was to illuminate the GPS Integrity light during final approach to Woodbourne but before the MAP. The control sector was swapped with the experimental sector to mitigate any 'practice' effects. The number of crews who undertook the simulator exercises were sufficient for the results to be statistically reliable.

4.3 At Woodbourne, the RNAV (GNSS) missed approach procedure requires the aircraft to cross the MAP and then make a right turn, as shown in Figure 2. The VOR missed approach requires the aircraft to fly straight ahead and then make a left turn to go back across the VOR, as shown in Figure 3.

4.4 During the sector with the induced GPS Integrity fault, approximately 75 % of crews made significant errors. In terms of handling the aircraft, there were several significant failures such as altitude busts, exceeding speed limitations (fast and slow) and failing to raise the flaps.

4.5 In considering the navigation aspects of the exercise, there were numerous errors. The most significant error was that about 25 % of crews flew the procedure with the Integrity light on; this highlighted considerable misunderstanding of the meaning of the light and the actions that needed to be taken. In one case, the crew attempted to fly the RNAV missed approach procedure using the VOR.



4.7 The GA button problem could be resolved with training but it also highlights a control design human factors issue. While the actual design is common in many aircraft, the human factors associated with control design and how they are actually used by pilots is an important consideration – putting a button in and expecting a pilot to use it is not always the answer.

4.8 As an additional experiment, some crews were asked to fly an RNAV track with the FMS turned off. This proved to be extremely difficult for all crews with most crews falling back to dead reckoning with headings that they thought would work. A significant finding for this exercise was that it is very difficult for crews to maintain situational awareness in an RNAV environment by reference to conventional means of navigation.

4.9 The report concluded that some of the errors during the missed approach probably stemmed from a breakdown of normal monitoring because of the high workload and crews choosing to prioritise something else over the basic monitoring task. There was clear evidence of attention capture. The report recommends that more non-normal situations are trained for and practiced in the simulator, particularly the more challenging situations.

4.10 The most likely failure mode of RNAV systems is a system failure; the loss of signal GNSS failure mode is considered to be less likely than a system failure. By having dual RNAV systems that are fully integrated into the aircraft flight instruments and autopilot, in the event of a system failure, the source of flight guidance is transferred to the second RNAV system. This removes most of the problems associated with a FMS failure in a single system installation.

4.11 In interviews, many pilots did not appreciate the reliability issues with single systems; few addressed the failure issue. Many of the pilots had come through general aviation where FMS's are rare; they appeared to be impressed by it and not understand its weaknesses. Many confused the multiple inputs and system accuracy with reliability. In the interviews and exercises it was apparent that crews treated the FMS as a primary navigation source and were failing to monitor the secondary system. The analysis work showed that the redundant systems are not actually redundant because there is a low probability that a failure in the primary navigation system will be detected by the crew.

4.12 In view of the Cranfield findings, the CAA is of the view that there is a strong safety case to require dual RNAV installations for commercial operations. In the unlikely event all RNAV navigation is lost, the crew should initiate a go around, execute a DR extraction procedure and then transition to an alternate means of navigation. Attempting to carry out a go around and transition to an alternate means of navigation is creating a situation where there is a risk that significant errors will be made. The DR extraction procedure for each approach should be part of the operator's route guide.

4.13 The near simultaneous loss of navigation with dual RNAV systems is most likely to occur if there is a GNSS loss of signal failure. Multi sensor systems are less susceptible to simultaneous failures and will be required when guided missed approaches or extractions are needed. Where aircraft are fitted with GNSS only RNAV systems, the simultaneous failure case should be planned for.

4.14 The report is critical of the design of charts being used in that data is not presented on charts in the best possible way. The charts used had terrain marked as spot heights; this makes it difficult for the crew to build a spatial mental picture of the local terrain.

4.15 The RNAV charts have been 'de-cluttered' with the conventional aids being removed. Most crews do not have the alternate charts with the additional information on hand. The result is that the additional information is being held in the pilot's head where it is vulnerable under arousal or high workload conditions i.e. the time when the information is needed most. The report makes a strong and clear finding that procedure and chart designers had accomplished their roles of making approved components but had fallen short in terms of producing a user centred design.

4.16 In conducting the research for the report, disparities between pilots on their understanding of system operation and the significance of items e.g. the GPS Integrity light and Flight Director modes and mode changes, was quite apparent. This suggests that training may not be as effective as anticipated even though there were competent instructors using suitable training material

and methods; there were indications that different learning styles were present in the crews who participated in the review. Training effectiveness therefore needs to be monitored to ensure that learning objectives are attained and demonstrated in the operating environment rather than just in the classroom or simulator.

4.17 A final comment in the report noted that while all the individual elements for RNAV operations were complied with by the operator, there was no clear oversight responsibility for the whole system (aircraft, procedures, charts, training, currency, operations, and oversight). The approval process was exhaustive in terms of individual components but was fragmented in terms of the overall system. The conclusion drawn was that the overall working system had never really been approved.

5. CONCLUSIONS

5.1 The principal conclusions drawn from the report are:

- a. RNAV systems need to be installed in locations where they are readily visible and accessible to the crew under virtually all lighting conditions. Given that with single systems it is difficult to maintain situational awareness sufficiently to detect system malfunctions using conventional systems, RNAV systems should be dual systems fully integrated for redundancy.
- b. The architecture and operation of FMS systems is often not human centric so that there are many opportunities for crew to make operating errors.
- c. First and foremost, the crew must fly the aircraft. The old aviation adage of “Aviate, Navigate, Communicate” is still just as valid in the modern cockpit as it was generations ago.
- d. Chart design is a significant issue; charts needs to be user oriented and provide information useful to the crew in a manner that is easily understood by the crew. For example, distances should be read directly rather than having to be calculated; spot heights should be replaced by terrain shading so that the chart, a TAWS display and the actual terrain (the view out the window) all correlate.
- e. Training effectiveness needs to be actively monitored to ensure operational performance objectives are met.
- f. There needs to be organisational oversight of the whole system rather than the fragmented approach where only individual components are addressed.

5.2 CAANZ considers that the report to be good and timely work that raises important points that need to be heeded with the implementation of more RNAV operations, be they PBN or GNSS. In future rulemaking, it is proposed that the shortcomings identified in the report will be addressed by appropriate means. As part of the PBN implementation project, consideration will be given to:

- a. Requiring aircraft carrying out RNAV commercial operations to be fitted with dual RNAV systems fully integrated into the flight instrument systems and autopilot;
- b. Requiring systems architecture and installations to be user oriented with installations being assessed for adverse human factors conditions.
- c. Reviewing charting standards to address the points raised and ensure user orientation;

- d. Requiring operators to have DR extraction procedures for all procedures (that do not require precision extraction guidance) included in their route guides, particularly for aircraft with GNSS only systems fitted;
- e. Training programmes being required to address the training effectiveness and human factors issues raised by the report; and
- f. Revising RNAV operations oversight requirements.

PBN IMPLEMENTATION PROGRESS REPORT

State: (Name of State)

Date: (DD/MM/YY)

Designation of PBN Focal Point

Reference: APANPIRG Conclusion 18/55 –Designation of Contact Person for PBN Implementation

“That, by 31 December 2007, States designate a focal contact person responsible for performance based navigation implementation and provide details of the contact person to ICAO Asia/Pacific Regional Office accordingly.”

Status: (Nominated/ To be Nominated)

Focal Point: (Name, Designation, Mailing Address, Email, Phone, Fax)

State PBN Implementation Plan

Reference: APANPIRG Conclusion 18/53 – Development of State PBN Implementation Plans

“That, the Regional Office encourages States to begin development of their State PBN implementation plans in harmony with the development of the Asia/Pacific Regional PBN implementation plan being coordinated by the Asia/Pacific PBN Task Force for submission to APANPIRG/19.”

Status: (Adopted / To be adopted) by (name of a national body) and (Reviewed / To be reviewed) by ICAO APAC PBN TF

Note(s): (States may include information on publication date and location for State PBN Implementation Plan and other relevant information.)

Approach Operations

Reference: ICAO Assembly Resolution A36-23

“States and planning and implementation regional groups (PIRGs) complete a PBN implementation plan by 2009 to achieve: implementation of approach procedures with vertical guidance (APV) (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as back up for precision approaches by 2016 with intermediate milestones as follows: 30 percent by 2010, 70 percent by 2014.”

Status:

Implementation Targets (# of RWY Ends)			Completed (# of RWY Ends)		On Progress (# of RWY Ends)	
Y2010	Y2014	Y2016	LNAV	LNAV/VNAV	LNAV	LNAV/VNAV

Note(s): (States may include information on recent publications of new PBN approach procedures.)

Arrival and Departure Operations

Reference: 1) ICAO Assembly Resolution A36-23

“States and planning and implementation regional groups (PIRGs) complete a PBN implementation plan by 2009 to achieve: implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones.”

2) Interim Asia/Pacific PBN Regional Implementation Plan

“Short-term Implementation Targets: RNAV 1 SID/STAR for 50% of international airports by 2010 and 75% by 2012 and priority should be given to airports with RNP Approach.”

“Medium-term Implementation Targets: RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016. RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits.”

Implementation Targets (# of Int'l Airports)			Completed (# of Int'l Airports)		On Progress (# of Int'l Airports)	
Y2010	Y2014	Y2016	Arrival	Departure	Arrival	Departure

Note(s): (States may include information on recent publications with new PBN arrival/departure procedures.)



**INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE**

**ASIA/PACIFIC REGIONAL PERFORMANCE-BASED NAVIGATION
IMPLEMENTATION PLAN**

VERSION 1.0

September 2009

RECORD OF AMENDMENT

Version	Activity	Date
0	Adopted by APANPIRG/19 as Interim Edition	September 2008
0.1	RASMAG Proposal	December 2008
0.2	Amended/Finalized by PBN/TF/4	March 2009
0.3	Amended/Finalized by PBN/TF/5	July 2009
1.0	Adopted by APANPIRG/20	September 2009

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ASIA/PACIFIC REGIONAL PERFORMANCE-BASED NAVIGATION IMPLEMENTATION PLAN

1. Executive Summary

1.1 This Asia/Pacific Regional PBN Implementation Plan has been produced in line with Resolution A 36/23 adopted by ICAO Assembly in its 36th Session held in September 2007 and Conclusion 18/52 adopted by APANPIRG/18. The Regional PBN Plan addresses the strategic objectives for PBN implementation based on clearly established operational requirements, avoiding equipage of multiple on-board or ground based equipment, avoidance of multiple airworthiness and operational approvals and explains in detail contents relating to potential navigation applications. The Plan envisages the conduct of pre- and post-implementation safety assessments and continued availability of conventional air navigation procedures during transition. The Plan also discusses issues related to implementation which include traffic forecasts, aircraft fleet readiness, adequacy of ground-based CNS infrastructure etc. Implementation targets for various categories of airspace for the short term (2008 – 2012) and for the medium term (2013 – 2016) have been projected in tabular forms to facilitate easy reference. For the long term (2016 and beyond) it has been envisaged that GNSS will be the primary navigation infrastructure. It is also expected that precision approach capability using GNSS and its augmentation system will become available in the long term.

2. Explanation of Terms

2.1 The drafting and explanation of this document is based on the understanding of some particular terms and expressions that are described below:

2.1.1 **Asia/Pacific Regional PBN Implementation Plan.** A document adopted by APANPIRG, often referred to as the “Regional PBN Plan”, offering appropriate guidance for air navigation service providers, airspace operators and users, regulating agencies, and international organizations—on the evolution of navigation capabilities as one of the key systems supporting air traffic management, and which describes the RNAV and RNP navigation applications that should be implemented in the short, medium and long term in the APAC Region.

2.1.2 **Performance Based Navigation** Performance based navigation specifies RNAV and RNP system performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in an airspace.

2.1.3 **Performance requirements.** Performance requirements are defined in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept. Performance requirements are identified in navigation specifications which also identify which navigation sensors and equipment may be used to meet the performance requirement.

3. Acronyms

3.1 The acronyms used in this document along with their expansions are given in the following list

ABAS	Aircraft-Based Augmentation System
AIS	Aeronautical Information Services
APAC	Asia and Pacific
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Regional Group
APCH	Approach
APV	Approach Procedures with Vertical Guidance
ATC	Air Traffic Control
Baro VNAV	Barometric Vertical Navigation

CNS/ATM	Communication Navigation Surveillance/Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
DME	Distance Measuring Equipment
EMA	En-route Monitoring Agency
FASID	Facilities and Services Implementation Document
FIR	Flight Information Region
FMS	Flight Management System
GBAS	Ground-Based Augmentation System
GNSS	Global Navigation Satellite System
GRAS	Ground-based Regional Augmentation System
IATA	International Air Transport Association
IFALPA	International Federation of Air Line Pilots' Associations
INS	Inertial Navigation System
IRU	Inertial Reference Unit
PANS	Procedures for Air Navigation Services
PBN	Performance Based Navigation
PIRG	Planning and Implementation Regional Group
RASMAG	Regional Airspace Safety Monitoring Advisory Group
RCP	Required Communication Performance
RNAV	Area Navigation
RNP	Required Navigation Performance
SARP	Standards and Recommended Practices
SBAS	Satellite-Based Augmentation System
SID	Standard Instrument Departure
STAR	Standard Instrument Arrival
TMA	Terminal Control Area
VOR	VHF Omni-directional Radio-range
WGS	World Geodetic System

4. Introduction

Need for the regional PBN Implementation Plan

4.1 The Thirty-sixth Session of the ICAO Assembly held in Montreal in September 2007 adopted a Resolution to resolve that States and PIRGs complete a regional PBN implementation plan by 2009.

4.2 Recognizing that the PBN concept is now established, States should ensure that all RNAV and RNP operations and procedures are in accordance with the PBN concept as detailed in State letter AN 11/45-07/22 and the ICAO Doc 9613: PBN Manual for ensuring a globally harmonized and coordinated transition of PBN.

4.3 In view of the need for detailed navigation planning, it is advisable to develop a Regional PBN Plan to provide proper guidance to air navigation service providers, airspace operators and users, regulating agencies, and international organizations, on the evolution of navigation capabilities as one of the key systems supporting air traffic management, and which describes the RNAV and RNP navigation applications that should be implemented in the short and medium term in the APAC Region.

4.4 Furthermore, the Asia/Pacific Regional PBN Implementation Plan will contain the basic material serving as guidance for regional projects for the implementation of air navigation infrastructure, such as ABAS, SBAS, GBAS, GRAS, etc., as well as for the development of national implementation plans.

Roles of Navigation in supporting ATM operations

4.5 An “airspace concept” may be viewed as a general vision or master plan for a particular airspace. Based on particular principles, an airspace concept is geared towards specific objectives. Strategic objectives drive the general vision of the airspace concept. These objectives are usually identified by airspace users, air traffic management (ATM), airports as well as environmental and government policy. It is the function of the airspace concept and the concept of operations to respond to these requirements. The strategic objectives which most commonly drive airspace concept are safety, capacity, efficiency, access, and the environment.

4.6 Navigation is one of several enablers of an airspace concept. Communications, ATS Surveillance and ATM are also essential elements of an airspace concept.

4.7 The PBN-concept specifies RNAV and RNP system performance requirements in terms of accuracy, integrity, availability, continuity and functionality needed for the proposed operations in the context of a particular Airspace Concept, when supported by the appropriate navigation infrastructure. In that context, the PBN concept represents a shift from sensor-based to performance-based navigation. Performance requirements are identified in navigation specifications which also identify the choice of navigation sensors and equipment that may be used to meet the performance requirements. These navigation specifications are defined at a sufficient level of detail to facilitate global harmonization by providing specific implementation guidance for States and operators.

4.8 Under the PBN concept, the generic navigation requirements are defined based on operational requirements. Thus, users may evaluate the available options. To ensure synchronization of investment and interoperability of the airborne and ground systems, the selection of the solution should be in consultation with aviation stakeholders, including international and domestic airline operators, air navigation service providers, and regulators. The solution selected should also be the most cost-effective one.

4.9 The development of the PBN concept recognized that advanced aircraft RNAV systems are achieving an enhanced and predictable level of navigation performance accuracy which, together with an appropriate level of functionality, allows a more efficient use of available airspace to be realized. It also takes account of the fact that RNAV systems have developed over a 40-year period and as a result there were a large variety of differing implementations globally. Identifying navigation requirements rather than on the means of meeting the requirements will allow use of all RNAV systems meeting these requirements irrespective of the means by which these are met.

Benefits of Performance-Based Navigation

4.10 The main benefits derived from the implementation of PBN are:

- a) Increased airspace safety through the implementation of continuous and stabilized descent procedures using vertical guidance;
- b) Reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel, noise reduction, and enhanced environmental protection;
- c) Use of the RNAV and/or RNP capabilities that already exist in a significant percentage of the aircraft fleet flying in APAC airspace;
- d) Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimized RNAV or RNP paths;
- e) Implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows;
- f) Reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas;
- g) Reduction of lateral and longitudinal separation between aircraft to accommodate more traffic;
- h) Decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring;

- i) Increase of predictability of the flight path.

Goals & Objectives of PBN Implementation

4.11 APANPIRG, in its Eighteenth meeting (September 2007), discussed various issues related to an early implementation of PBN in the region. To facilitate coordination between States, a PBN Task Force was formed under Conclusion 18/52 and tasked to develop a harmonized regional PBN implementation plan.

4.12 The Asia/Pacific Regional PBN Implementation Plan has the following strategic objectives:

- a) To ensure that the implementation of the navigation item of the CNS/ATM system is based on clearly established operational requirements.
- b) To avoid undue equipage of multiple on board equipment and/or ground-based systems.
- c) To avoid the need for multiple airworthiness and operational approvals for intra- and inter-regional operations.
- d) To explain in detail the contents of the Regional Air Navigation Plan, relating to potential navigation applications.

4.13 Furthermore, the Asia/Pacific Regional PBN Implementation Plan will provide a high-level strategy for the evolution of the navigation applications to be implemented in the APAC Region in the short term (2008-2012) and medium term (2013-2016). This strategy is based on the concepts of Area Navigation (RNAV) and Required Navigation Performance (RNP) in accordance with ICAO Doc. 9613: *Performance Based Navigation Manual*, and will be applied to aircraft operations involving instrument approaches, standard departure (SID) routes, standard arrival (STAR) routes, and ATS routes in oceanic and continental areas.

4.14 The Regional PBN Plan was developed by the APAC States together with the international organizations concerned (including IATA and IFALPA); and is intended to assist the main stakeholders of the aviation community plan a gradual transition to the RNAV and RNP concepts. The main stakeholders of the aviation community that benefit from this Regional Plan are:

- Airspace operators and users.
- Air navigation service providers.
- Regulating agencies.
- International organizations.

4.15 The Regional PBN Plan is intended to assist the main stakeholders of the aviation community plan the future transition and their investment strategies. For example, airlines and operators can use this Plan to derive future equipage and additional navigation capability investments; air navigation service providers can plan a gradual transition for the evolving ground infrastructure. Regulating agencies will be able to anticipate and plan for the criteria that will be needed in the future.

4.16 Recognizing the safety benefits of PBN, the thirty-sixth session of the ICAO Assembly held in Montreal, September 2007 adopted a Resolution to resolve that States and PIRGs prepare a PBN implementation plans by 2009 to achieve:

- a) Implementation of RNAV and RNP operations (where required) for en route and terminal areas according to established timelines and intermediate milestones; and
- b) Implementation of APV (Baro-VNAV and/or augmented GNSS) for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014.

The ICAO Assembly also urges that States include in their PBN implementation plan provisions for implementation of APV to all runway ends serving aircraft with a maximum certificated take-off mass of 5700 kg or more, according to established timelines and intermediate milestones.

Planning Principles

4.17 Planning for the implementation of PBN in the APAC Region shall be based on the following principles:

- a) Pre- and post-implementation safety assessments will be conducted in accordance with ICAO provisions to ensure the application and maintenance of the established target levels of safety.
- b) Continued application of conventional air navigation procedures during the transition period, to guarantee the operations by users that are not RNAV and/or RNP equipped.
- c) The first regional PBN implementation plan should address the short term (2008-2012) and medium term (2013-2016) and take into account long term global planning issues.
- d) Target date for preparation of the first regional PBN implementation plan is APANPIRG/19 (September 2007).

5. PBN Operational Requirements & Implementation Strategy

5.1 Introduction of PBN should be consistent with the Global Air Navigation Plan. Moreover, PBN implementation shall be in full compliance with ICAO SARPs and PANS and support relevant ICAO Global Plan Initiatives.

5.2 The ICAO Council accepted the second amendment to the Global Air Navigation Plan for the CNS/ATM System in November 2006. The approved plan has been renamed as Global Air Navigation Plan (Doc 9750). The relevant Global Plan Initiatives including implementation of performance based navigation (PBN) and navigation system have been included in the Global Plan. The introduction of PBN must be supported by an appropriate navigation infrastructure consisting of an appropriate combination of Global Navigation Satellite System (GNSS), self-contained navigation system (inertial navigation system) and conventional ground-based navigation aids.

5.3 The consolidated *Navigation Strategy for the Asia/Pacific Region* was reviewed and updated by the Thirteenth meeting of CNS/MET Sub Group of APANPIRG in July 2009. The updated strategy was reviewed and adopted by APANPIRG in its Twentieth meeting held in September 2009 under Conclusion 20/46.

Route Operations

5.4 As the routes structure and en-route operation are extensive and complicated in APAC - region, it is difficult to restructure and include the whole airspace in a single implementation plan for en-route operations.

5.5 Considering the traffic characteristics and CNS/ATM capability, en-route operations can be classified as Oceanic, Remote continental, and Continental en-route.

5.6 In principle, each classification of en-route operation (paragraph 5.5 above) should adopt, but not be limited to, a single RNAV or RNP navigation specification. This implementation strategy should be applied by implementing States in coordination with airspace users.

5.7 APANPIRG established the PBN Task Force to develop a PBN implementation plan for the Asia/Pacific Region and to address related regional PBN implementation issues. Accordingly, States are encouraged to work cooperatively bilaterally, multilaterally and with the PBN Task Force to ensure regional and sub-regional harmonization of en-route PBN implementation.

5.8 In areas where operational benefits can be achieved and appropriate CNS/ATM capability exists or can be provided for a more accurate navigation specification than that specified in this plan,

States are encouraged to introduce the more accurate navigation specification on the basis of coordination with stakeholders and affected States.

5.9 Similarly, in circumstances where affected States are agreeable to completing an implementation in advance of the timelines specified in this plan, early implementation is encouraged on the basis of coordination between affected States and airspace users.

TMA Operations

5.10 TMA operations have their own characteristics, taking into account the applicable separation minima between aircraft and between aircraft and obstacles. TMA operations also involve—the diversity of aircraft, including low-performance aircraft flying in the lower airspace and conducting arrival and departure procedures on the same path or close to the paths of high-performance aircraft.

5.11 In this sense and as called for under APANPIRG Conclusion 18/53, States shall develop their own national plans for the implementation of PBN in sovereign TMAs. Such national plans should be based on the Asia/Pacific Regional PBN Implementation Plan, seek the harmonization of the application of PBN and avoid the need for multiple operational approvals for intra- and inter-regional operations. Applicable aircraft separation criteria should also be considered.

Instrument Approaches

5.12 States are encouraged to introduce PBN approaches that provide Vertical Guidance to enhance safety. Conventional approach procedures and conventional navigation aids should be maintained to support non-equipped aircraft during the transitional period.

5.13 During early implementation of PBN, IFR Approaches based on PBN should be designed to accommodate a mixed-equipage (PBN and non-PBN) environment. ATC workload should be taken into account while developing approach procedures. One possible way to accomplish this is to co-locate the Initial Approach Waypoint for both PBN and conventional approaches

6. Current Status & Forecast

APAC traffic forecast

6.1 Traffic forecasts have a special role to play in the planning and implementation processes; they represent the demand for future ATM. Global Air Navigation Plan (Doc 9750) requires that the Planning and Implementation Regional Groups (PIRGs) base their work on well developed traffic density forecasts. Guidance on the preparation of traffic forecasts is provided in *Manual on Air Traffic Forecasting* (Doc 8991). At the Asia/Pacific regional level, the traffic forecasting activities were started with the formation of ICAO Pacific Area Traffic Forecasting Group formed in 1991. The scope of the group was subsequently broadened to include Intra-Asia/Pacific traffic also and the group was renamed as Asia/Pacific Area Traffic Forecasting Group (APA TFG).

6.2 Report of the Fourteenth meeting of Asia/Pacific Area Traffic Forecasting Group (APA TFG/14) has been published as Doc 9915. Report includes medium term forecasts of air traffic in the Transpacific area and for selected Transpacific and Asia/Pacific city pair markets through 2012. Report also contains a long term forecast with a horizon to the year 2025 and the short term forecast for the period 2008 – 2010 and intermediate forecasts for each of the years 2015 and 2020. Forecasts are provided for total passenger traffic and aircraft movements and in the case of the aggregate transpacific market also for peak hour movements on selected groups for the year 2012.

6.3 The February 2008 forecast prepared by IATA—for APAC traffic in respect of passenger, cargo, aircraft movements and new aircraft deliveries in the Regions is also provided in the Appendix B to this plan as reference.

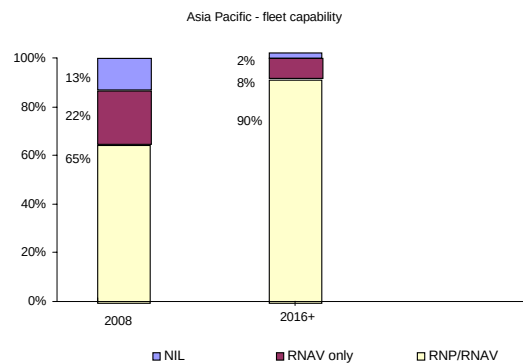
Aircraft fleet readiness status

6.4 2007 was a record year for Asia/Pacific airlines with 418 new aircraft deliveries and more than 1,000 new orders. The overall number of deliveries to Asia/Pacific based airlines in 2008 is expected to total 430 aircraft.

6.5 All major commercial aircraft manufacturers since the 1980's have included RNAV capabilities. The commercial aircraft currently produced incorporate an RNP capability.

6.6 One significant issue for PBN implementation today is directly related to the multitude of FMS installations and varying degrees of capabilities associated with the current fleet of RNAV aircraft. Specifically, there are numerous FMS systems installed in today's fleets, all with varying capabilities.

6.7 The diagram below displays a high level analysis based on fleet numbers from Ascend Online Fleets database March 2008 and RNAV/RNP classification by IATA.



CNS Infrastructure

Navigation infrastructure

Global Navigation Satellite System (GNSS)

6.8 Global Navigation Satellite System (GNSS) is a satellite-based navigation system utilizing satellite signals, such as Global Positioning System (GPS), for providing accurate and reliable position, navigation, and time services to airspace users. In 1996, the International Civil Aviation Organization (ICAO) endorsed the development and use of GNSS as a primary source of future navigation for civil aviation. ICAO noted the increased flight safety, route flexibility and operational efficiencies that could be realized from the move to space-based navigation.

6.9 GNSS supports both RNAV and RNP operations. Through the use of appropriate GNSS augmentations, GNSS navigation provides sufficient accuracy, integrity, availability and continuity to support en-route, terminal area, and approach operations. Approval of RNP operations with appropriate certified avionics provides on-board performance monitoring and alerting capability enhancing the integrity of aircraft navigation.

6.10 GNSS augmentations include Aircraft-Based Augmentation System (ABAS), Satellite-Based Augmentation System (SBAS), Ground-Based Augmentation System (GBAS), and Ground-based Regional Augmentation System (GRAS).

Other PBN navigation infrastructure

6.11 Other navigation infrastructure includes INS, VOR/DME, DME/DME, and DME/DME/IRU. These navigation infrastructures may satisfy the requirements of RNAV navigation specifications, but not those of RNP.

6.12 INS may be used to support PBN en-route operations with RNAV 10 and RNAV 5 navigation specifications.

6.13 VOR/DME may be used to support PBN en-route and STAR operations based on the RNAV 5 navigation specification.

6.14 Uses of DME/DME and DME/DME/IRU may support PBN en-route and terminal area operations based on RNAV 5, RNAV 2 or RNAV 1 navigation specifications. Validation of DME/DME coverage area and appropriate DME/DME geometry should be conducted to identify possible DME/DME gaps, including identification of critical DMEs, and to ensure proper DME/DME service coverage.

Surveillance infrastructure

6.15 For RNAV operations, States should ensure that sufficient surveillance coverage is provided to assure the safety of the operations. For RNP operations, surveillance coverage may not be required. Details on the surveillance requirements for PBN implementation can be found in the ICAO PBN Manual and ICAO PANS-ATM (Doc 4444), and information on the current existing surveillance infrastructure in APAC can be found in ICAO FASID tables.

Communication infrastructure

6.16 Implementation of RNAV/RNP routes includes communication requirements. Details on the communication requirements for PBN implementation can be found in ICAO PANS-ATM (Doc 4444), ICAO RCP Manual (Doc 9869), and ICAO Annex 10. Information on the current existing communication infrastructure in APAC can also be found in ICAO FASID tables.

7. Implementation Plan for Performance Based Navigation

ATM Operational Requirements

7.1 The Global ATM Operational Concept (Doc 9854) makes it necessary to adopt an airspace concept able to provide an operational scenario that includes route networks, minimum separation standards, assessment of obstacle clearance, and a CNS infrastructure that satisfies specific strategic objectives, including safety, access, capacity, efficiency, and environment.

7.2 In this regard, the following programmes will be developed:

- a) traffic and cost benefit analyses
- b) necessary updates on automation
- c) operational simulations in different scenarios
- d) ATC personnel training
- e) Flight plan processing
- f) Flight procedure design training to include PBN concepts and ARINC-424 coding standard
- g) Enhanced electronic data and processes to ensure appropriate level of AIS data accuracy, integrity and timeliness
- h) WGS-84 implementation in accordance with ICAO Annex 15
- i) uniform classification of adjacent and regional airspaces, where practicable
- j) RNAV/RNP applications for SIDs and STARs

- k) Coordinated RNAV/RNP routes implementation
- l) RNP approach with vertical guidance

Short Term Implementation Plan

Route Operations

7.3 During the planning phase of any implementation of PBN routes, States should gather inputs from all aviation stakeholders to obtain operational needs and requirements. These needs and requirements should then be used to derive airspace concepts and to select appropriate PBN navigation specification.

7.4 In this phase, the application of RNAV 10 and RNP 4 navigation specifications is expected for Oceanic and Remote continental routes. Prior to implementation of RNP 4, States should consider air traffic demands, ATC workload, surveillance and communication capabilities and fleet readiness statistics, and consult all stakeholders.

7.5 For Continental routes, the application of RNAV 5 and RNAV 2 navigation specifications is expected. In the continental en-route areas of operation, States may choose to implement RNAV 2 routes to enhance efficiency of airspace usage and support closer route spacing, noting that appropriate communication and surveillance coverage must be provided. The RNAV 2 navigation specification can also be used in airspace, where sufficient CNS capability is provided and there are operational benefits.

TMA Operations

7.6 In selected TMAs, the application of RNAV 1 in a radar environment can be supported though the use of GNSS or ground navigation infrastructure, such as DME/DME and DME/DME/IRU. In this phase, mixed operations (equipped and non-equipped) will be permitted.

7.7 In a non-radar environment and/or in an environment without adequate ground navigation infrastructure, the SID/STAR application of Basic-RNP1 is expected in selected TMAs with exclusive application of GNSS. In this phase, mixed operations (equipped and non-equipped) will be permitted.

Instrument Approaches

7.8 The application of RNP APCH with Baro-VNAV procedures is expected to be implemented in the maximum possible number of airports, commencing primarily with international airports. To facilitate transitional period, conventional approach procedures and conventional navigation aids should be maintained for non-equipped aircraft.

7.9 States should promote the use of APV operations (Baro-VNAV or augmented GNSS) to enhance safety and accessibility of RNP approaches.

7.10 The application of RNP AR APCH procedures should be considered in selected airports, where obvious operational benefits can be obtained due to the existence of significant obstacles.

Summary table & Implementation targets

Short Term (2008-2012)*		
Airspace	Preferred Nav. Specifications	Acceptable Nav. Specifications
Route – Oceanic	RNP 4	RNAV 10
Route – Remote continental	RNP 4	RNAV 10
Route – Continental en-route	RNAV 2, RNAV 5	
TMA – Arrival	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
TMA – Departure	RNAV 1 in radar environment and with adequate navigation infrastructure. Basic-RNP 1 in non-radar environment	
Approach	RNP APCH with Baro-VNAV in most possible airports RNP AR APCH in airport where there are obvious operational benefits.	
Implementation Targets • RNP APCH (with Baro-VNAV) in 30% of instrument runways by 2010 and 50% by 2012 and priority should be given to airports with operational benefits • RNAV 1 SID/STAR for 50% of international airports by 2010 and 75% by 2012 and priority should be given to airports with RNP Approach • Re-defining existing RNAV/RNP routes into PBN navigation specification by 2012 • Implementation of additional RNAV/RNP routes		

* **Note:** Early completion of an implementation is encouraged within the timeframe on the basis of coordination between affected States and airspace users.

Medium Term Implementation Plan

Route Operations

7.11 Noting the current development of route spacing standards for RNAV 1, RNAV 2, RNP 2, in this phase, it is expected that the implementations of all existing RNAV/RNP routes are consistent with PBN standards. States are encouraged to harmonize their RNAV/RNP routes based on consistent PBN navigation specifications and separation standards. Implementations of additional RNAV/RNP routes are also encouraged.

7.12 With the utilization of ADS and CPDLC, the application of RNP routes in the Oceanic and Remote continental airspace in the APAC Region is expected. This will permit the use of smaller lateral and longitudinal separation, such as 30 NM based on the RNP 4 navigation specification. States should also consider the fleet readiness status during their planning.

7.13 Noting the current development of RNP 2 navigation specification, in this phase, the application of RNP 2 is expected for the continental en-route airspace with high air traffic density. Depending on the sufficiency of DME/DME coverage or GNSS availability, States may consider the use of RNAV 2 navigation specification.

7.14 In this phase, the establishment of a backup system in case of GNSS failure or the development of contingency procedures will be necessary.

TMA Operations

7.15 Noting the current development of Advanced RNP 1 navigation specification, in this phase, it is expected that the application of RNAV 1 or RNP 1 will be expanded in selected TMAs. The application of RNAV 1/RNP 1 will also depend on DME/DME infrastructure, GNSS availability and aircraft navigation capability. In TMAs of high air traffic complexity and movement, the use of RNAV 1 or RNP 1 equipments will be mandatory. In TMAs of less air traffic complexity, mixed operations will be permitted (equipped or non-equipped).

Instrument Approaches

7.16 In this phase, the extended application of RNP APCH with Baro-VNAV or APV in most airports is expected. These applications may also serve as a back-up to precision approaches and provide vertical guided approaches for the runways without precision approach capability.

7.17 The extended application of RNP AR Approaches is expected for airports where there are operational benefits.

7.18 The introduction of application of landing capability using GNSS and its augmentations is expected to guarantee a smooth transition toward high-performance approach and landing capability.

Summary table & Implementation targets

Medium Term (2013-2016)*		
Airspace	Preferred Nav. Specification	Acceptable Nav. Specification
Route – Oceanic	RNP 2**, RNP 4	RNAV 10
Route – Remote continental	RNP 2	RNAV 2, RNP 4, RNAV 10
Route – Continental en-route	RNAV 1, RNP 2	RNAV 2, RNAV 5
TMA – Arrival	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
TMA – Departure	Expand RNAV 1 or RNP 1 application Mandate RNAV 1 or RNP 1 approval for aircraft operating in higher air traffic density TMAs	
Approach	Expansion of RNP APCH (with Baro-VNAV) and APV Expansion of RNP AR APCH where there are operational benefits Introduction of landing capability using GNSS and its augmentations	
Implementation Targets • RNP APCH with Baro-VNAV or APV in 100% of instrument runways by 2016 • RNAV 1 or RNP 1 SID/STAR for 100% of international airports by 2016 • RNAV 1 or RNP 1 SID/STAR for 70% of busy domestic airports where there are operational benefits • Implementation of additional RNAV/RNP routes		

* **Note 1:** In circumstances where affected States are agreeable to completing an implementation in advance of the timeline, early implementation is encouraged on the basis of coordination between affected States and airspace users.

** **Note 2:** Related CNS requirements and operational procedures for RNP 2 application in Oceanic Airspace are yet to be determined.

Long Term Implementation Strategies (2016 and beyond)

7.19 In this phase, GNSS is expected to be a primary navigation infrastructure for PBN implementation. States should work co-operatively on a multinational basis to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on GNSS implementation and operation.

7.20 Moreover, during this phase, States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance.

7.21 With the expectation that precision approach capability using GNSS and its augmentation systems will become available, States are encouraged to explore the use of such capability where there are operational and financial benefits.

8. Transitional Strategies

8.1 During transition to PBN, sufficient ground infrastructure for conventional navigation systems must remain available to serve non-equipped flights. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip appropriately to attain equivalent PBN-based navigation performance. States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised. Performance of safety assessments and consultation with users through regional air navigation planning processes will be necessary.

8.2 States should coordinate to ensure that harmonized separation standards and procedures are developed and introduced concurrently in all flight information regions along major traffic flows to allow for a seamless transition towards PBN.

8.3 States should cooperate on a multinational basis to implement PBN in order to facilitate seamless and inter-operable systems and undertake coordinated research and development programmes on PBN implementation and operation.

8.4 States are encouraged to consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance, taking due consideration of the needs of State aircraft.

8.5 States should encourage operators and other airspace users to equip with PBN-capable avionics. This can be achieved through early introductions of RNP approaches, preferably those with vertical guidance.

8.6 ICAO Asia-Pacific Regional Office should provide leadership supporting implementation and transition towards PBN.

9. Safety Assessment & Monitoring Requirements

Need for a safety assessment

9.1 To ensure that the introduction of PBN applications within the Asia/Pacific Region is undertaken in a safe manner, in accordance with relevant ICAO provisions implementation shall only take place following conduct of a safety assessment by the implementing State or group of States that demonstrates that an acceptable level of safety will be met. This assessment may also need to demonstrate that residual levels of risk associated with specific PBN implementations are acceptable. Additionally, after implementation ongoing periodic safety reviews shall be undertaken by the implementing State or group of States, where required, in order to establish that operations continue to meet acceptable levels of safety.

En-route safety assessment and monitoring

9.2 When considering en-route PBN implementations, the ICAO *Procedures for Air Navigation Services – Air Traffic Management* (PANS-ATM, Doc 4444, Chapter 5, Section 5.4) contains procedures and RNAV procedural separation minima for use in the separation of aircraft in the en-route phase. In some cases, these separation minima require specific RNP capabilities and are based

on collision risk modelling which determines communications and surveillance requirements. However, this modelling does not include all operational and technical aspects and is dependent upon parameter values that may vary depending on the particular airspace where the separation minimum will be applied. Therefore, prior to implementation, a system verification of sufficient duration and integrity must be performed to assess such parameters and conditions including weather deviations or other contingency events for the airspace concerned and to demonstrate that operational and technical requirements will be met.

9.3 APANPIRG has established the Regional Airspace Safety Monitoring Advisory Group (RASMAG) to facilitate the airspace safety monitoring aspects for implementations of reduced separation minima and CNS/ATM applications within the Asia and Pacific Regions. RASMAG has adopted the term En-route Monitoring Agency (EMA) to describe an organization providing airspace safety assessment, monitoring and implementation services for international airspace in the Asia/Pacific region to assist the implementation and operation of reduced horizontal (lateral and longitudinal) separation minima. To ensure regional harmonization of en-route safety assessment requirements and methodologies, implementing States are encouraged to work cooperatively with RASMAG who will provide guidance and technical assistance to States to support their en-route PBN implementations.

Undertaking a safety assessment

9.4 The implementing State or group of States shall ensure that a safety assessment and, where required, ongoing monitoring of PBN implementations are conducted. The implementing State or group of States may have the capability to undertake such activities or, in the case of en-route implementations, may seek assistance from an En-route Monitoring Agency. The latter course of action is preferred as an EMA can establish the necessary monitoring and data collection activity in an effective manner for the international airspaces in which the EMA holds responsibility.

9.5 In undertaking a safety assessment to enable en-route implementation of PBN, a State authority or EMA shall:

- 1) Establish and maintain a database of PBN approvals;
- 2) Pre-implementation - conduct safety and readiness assessments and, for international implementations, report results to RASMAG;
- 3) Post-implementation - maintain awareness of data link performance and monitor aircraft horizontal-plane navigation performance and the occurrence of large navigation errors (lateral and longitudinal), implement remedial actions as necessary and, for international implementations, report results to RASMAG;
- 4) Monitor operator compliance with State approval requirements after PBN implementation;
- 5) Initiate necessary remedial actions in any instances where PBN requirements are not met.

9.6 Detailed information relating to the international airspace jurisdiction, roles and responsibilities of regional EMAs is contained in the *Asia/Pacific En-route Monitoring Agency Handbook*, which is available from the ICAO Asia/Pacific Regional Office.

Appendix A – CHANGES TO THE ASIA/PACIFIC REGIONAL PBN IMPLEMENTATION PLAN

Whenever a need is identified for a change to this document, the Request for Change (RFC) Form (see below) should be completed and submitted to the ICAO Asia and Pacific Regional Office. The Regional Office will collate RFCs for consideration by the Performance Based Navigation Task Force (CNS/MET Sub-group of APANPIRG).

When an amendment has been agreed by a meeting of the Performance Based Navigation Task Force then a new version of the PBN Regional Plan will be prepared, with the changes marked by an “|” in the margin, and an endnote indicating the relevant RFC, so a reader can see the origin of the change. If the change is in a table cell, the outside edges of the table will be highlighted; e.g.:

Final approval for publication of an amendment to the PBN Regional Plan will be the responsibility of APANPIRG.

PBN Regional Plan REQUEST FOR CHANGE FORM

RFC Nr:	

Please use this form when requesting a change to any part of this PBN Regional Plan. This form may be photocopied as required, emailed, faxed or e-mailed to ICAO Asia and Pacific Regional Office +66 (2) 537-8199 or icao_apac@bangkok.icao.int

1. SUBJECT:	
2. REASON FOR CHANGE:	
3. DESCRIPTION OF PROPOSAL: [expand / attach additional pages if necessary]	
4. REFERENCE(S):	
5. PERSON INITIATING:	DATE:
ORGANISATION:	
TEL/FA/X/E-MAIL:	

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6. CONSULTATION		RESPONSE DUE BY DATE:	
	Organization	Name	Agree/Disagree
			Date
7. ACTION REQUIRE :			
8. PBN REGIONAL PLAN EDITOR		DATE REC'D :	
9. FEEDBACK PASSED		DATE :	

AMENDMENT RECORD

Amendment Number	Date	Amended by	Comments

Appendix B – IATA Traffic Forecast

“By 2010 Asia will be the largest single market for aviation” - IATA 27th Feb 2008. Globally predicted passenger traffic will rise by 4.9 per cent per year between 2007 and 2026, almost trebling in two decades as jet planes got bigger and more people flew on them. Meanwhile airfreight will rise by 5.8 per cent annually in the same period. The greatest demand will come from the Asia-Pacific region, where airlines will take delivery of 31 per cent of new planes in the next 20 years, compared with 24 per cent for Europe and 27 per cent for North America.

Passenger

Asia Pacific airlines saw a marginal drop in demand growth from 6.2 per cent in December 2007 to 5.7 per cent in January 2008. Currently, airlines in the region benefited from increased competitiveness due to the strong Euro and the booming economies of both India and China.

Cargo

Steady year-on-year airfreight growth of 4.5 per cent was recorded in January 2008. In the larger freight markets there is continued strength. Asia Pacific airlines saw demand increase 6.5 per cent, up from 6 per cent in December 2007, boosted by the booming economies in China and India.

For the period 2002-2020 aircraft movements are expected to increase at an annual growth rate of 5.4 per cent, to reach almost 294 thousand aircraft movements by the year 2020. Average annual growth rates of 6.5, 5.7 and 5.2 per cent are forecast for the periods 2005 - 2010, 2010-2015 and 2015 - 2020, respectively.

<u>TRANSPACIFIC PASSENGER FORECAST</u>			
Average Annual Percentage Growth Rates			
	Low	Medium	High
2005-2010	5.3	6.5	7.8
2010-2015	4.5	5.7	7.0
2015-2020	4.0	5.2	6.5
2002-2020	4.1	5.4	6.7

The Intra-Asia/Pacific passenger aircraft movements are expected to increase at an average annual growth rate of 4.6 per cent to the year 2020. The growth rates for the intermediate periods of 2005-2010, 2010- 2015 and 2015-2020 are 5.0, 4.3 and 4.2 per cent, respectively.

<u>INTRA ASIA /PACIFIC AIRCRAFT MOVEMENT FORECAST</u>			
Average Annual Percentage Growth Rates			
	Low	Medium	High
2005-2010	3.6	5.0	5.5
2010-2015	3.1	4.3	5.2
2015-2020	3.1	4.2	5.2
2002-2020	3.3	4.6	5.6

New Aircraft Deliveries by Region

Record new aircraft orders were placed by the airline industry in 2005 – 2007. The large numbers of new orders represent strong confidence in the future prospects of the global airline industry. In its latest forecast of aviation growth, European aircraft maker Airbus said the world's fleet of large

passenger jets (of more than 100 seats) would double in the next 20 years to nearly 33,000. The greatest demand will come from the Asia-Pacific region, where airlines will take delivery of 31 per cent of new planes in the next 20 years, compared with 24 per cent for Europe and 27 per cent for North America.

New Aircraft Deliveries by Region	2006	2007	2008	2009	2010	2011	2012+
	Existing						
Africa	665	26	15	20	16	13	28
Asia Pacific	3,578	329	428	407	344	267	440
Europe	5,301	292	348	364	251	153	297
Latin America/Caribbean	1,031	93	91	45	66	43	65
Middle East	626	41	57	44	36	27	164
North America	6,987	240	293	309	222	163	412
Total	18,188	1,026	1,237	1,208	944	679	1,551
Increase in Global aircraft fleet (%)	4.2	4.9	4.6	4.9	3.4	2.4	2.4

Appendix C - Reference documentation for developing operational and airworthiness approval

- *General Guidelines for Obtaining Airworthiness and Operational Approvals for PBN Navigation Specifications, Version 1.0, International Air Transport Association*, August 2008. (URL - <http://www2.icao.int/en/pbn/ICAO%20Documentation/State%20and%20International%20Organization%20Publications/IATA%20Guidelines%20for%20PBN%20Operational%20Approval.pdf>)

Appendix D – Practical Example of tangible benefits

Practical examples of tangible benefits derived from the implementation of PBN are:

- Increased airspace safety through the implementation of continuous and stabilized descent procedures using vertical guidance;
- Provision of runway-aligned final approach path which may not be possible from conventional navigation
- Reduced aircraft flight time due to the implementation of optimal flight paths, with the resulting savings in fuel, noise reduction, and enhanced environmental protection;
- Improved airport and airspace arrival paths in all weather conditions, and the possibility of meeting critical obstacle clearance and environmental requirements through the application of optimized RNAV or RNP paths;
- Implementation of more precise approach, departure, and arrival paths that will reduce dispersion and will foster smoother traffic flows;
- Reduced delays in high-density airspaces and airports through the implementation of additional parallel routes and additional arrival and departure points in terminal areas;
- Reduction of lateral and longitudinal separation between aircraft to accommodate more traffic;
- Decrease ATC and pilot workload by utilizing RNAV/RNP procedures and airborne capability and reduce the needs for ATC-Pilot communications and radar vectoring;
- Increase of predictability of the flight path.
- Reduction of maintenance and flight inspection costs associated with conventional navigation aids

REVISED NAVIGATION STRATEGY FOR THE ASIA/PACIFIC REGION

Considering:

- a) the material contained in the Performance Based Navigation Manual (Doc 9613) for enroute, approach, landing and departures operations;
- b) operators will equip aircraft to support PBN operations;
- c) GNSS will be the predominant navigation sensor;
- d) APV operations may be conducted with BARO-VNAV or augmented GNSS;
- e) Augmented GNSS will support Category I operations by end 2009 and Category II and III operations by 2015;
- f) in the Asia/Pacific Region, ILS is capable of meeting the majority of requirements for precision approach and landing;
- g) MLS CAT III is operational;
- h) the need to maintain aircraft interoperability both within the Region and between the Asia/Pacific Region and other ICAO regions and to provide flexibility for future aircraft equipage.

Strategy

- a) transit to PBN operations as follows :-
 - i) RNP10/RNP4 for Oceanic and Remote Continental routes;
 - ii) RNAV5/RNAV2 for Continental En-route;
 - iii) RNAV1, RNAV2 and Basic RNP1 based arrivals and departure;
 - iv) APV **;
 - v) Precision approaches at selected runways.

with respective end states as follows:

- vi) RNP4 for Oceanic and Remote Continental routes;
- vii) RNP1/RNP2 for Continental En-route;
- viii) RNP1 and RNP0.3 based arrivals and departure;
- ix) APV**;
- x) Precision approaches at selected runways.

Note: Ideally, end-state should follow the above process but may be achieved directly without transitting through the immediate phases (i.e. (i) to (v)), if considered safe to do so.

- b) retain ILS as an ICAO standard system for as long as it is operationally acceptable & economically beneficial;
- c) implement GNSS with augmentation as required for APV and precision approach operations where operationally required and economically beneficial;
- d) implement the use of APV operation in accordance with ICAO's requirement;
- e) protect all the Aeronautical Radio Navigation Service (ARNS) frequencies; and
- f) ensure civil-military interoperability.

** APV includes BARO-VNAV, RNP, RNP-AR, APV 1 & 2

Review areas of possible misinterpretations in ICAO Doc 8071

It was noted that certain areas of recommendations contained in ICAO Doc8071 not explicitly or conclusively stated, can be misinterpreted from their true intention. Although such cases may not have an effect on safety, they may lead to unnecessary delay and cost.

Same cases of possible inconsistent interpretation were identified as follows:

- Case 1, Alignment Monitor for Localizer procedure. Section 4.3.38 a) describes recommendation on Alignment monitor procedure during Localizer course alignment and displacement sensitivity monitors, which is carried out toward the end after having performed Course Alignment Accuracy procedure in Section 4.3.26 already. Confirmation of the Alignment at normal operating condition can mean comparison and checking of the concerned parameters to be within tolerance, or repeating flight procedure for Course Alignment Accuracy in Section 4.3.26 again.
- Case 2, Modulation Level of 9960 Hz Subcarrier for VOR procedure. Section 2.3.17 describes recommendation on VOR Modulation and recommend Modulation of 9960 Hz Subcarrier to be $30 \pm 2\%$. In practice, the Modulation level can be obtained by flying an 8 NM radius orbit around VOR Transmitter, and sampling reading at every 10° for the mean value of Modulation level. However, multipath of signal may be occurred from reflection/absorption from surrounding obstacles or terrain, resulting in over tolerance of the subcarrier in some radial or sector; while the mean value is within the recommended range ($30 \pm 2\%$). No specific guideline is currently available in Doc 8071 to such case and consequently how to evaluate the VOR facility.
- Case 3, Applicability of 95% Probability. Section 2.3.13 describes recommendation on roughness and scalloping error to be within 3.0" from the average course for inspecting VOR which is considered non-precision navaid. On the hand, Annex 10 Attachment C Figure C-2 points out the precision navaid ILS example and states recommendation to take the principle on 95% probability into consideration before evaluating course/path bend amplitude and whether the facility status to be restricted or not.
- Case 4, Use of Uncertainty Value. In various places of Doc 8071, "uncertainty" is referred to together with "tolerance". Uncertainty value is often associated with measurement of equipment, but no application of such value for flight inspection is stated in relation to tolerance limit.



**FLIGHT INSPECTION AND SERVICES DEPARTMENT
AIR TRAFFIC SERVICES PLANNING AND STANDARDS BUREAU
AERONAUTICAL RADIO OF THAILAND LIMITED**

FLIGHT INSPECTION REPORT – PERFORMANCE BASED NAVIGATION								FM-AV.PS-50	
1. RUNWAY				2. AIRCRAFT		3. DATE OF FLIGHT VALIDATION			
[AIRPORT / RUNWAY]				[CALL SIGN]		[DD-MMM-YYYY]			
4. TYPE OF PROCEDURE				5. GUIDANCE		6. NAVIGATION SPECIFICATION			
RNAV (GNSS) APPROACH				LNAV		[NAV SPEC]			
				LNAV / VNAV					
7. OWNER		DCA		USAF		OTHER (INDICATE ACTUAL OWNER)			
		RTAF		INTERNATIONAL					
8. PRE-FLIGHT VALIDATION									
A. RUNWAY COORDINATE SURVEY								C. SUPPORT DOCUMENTS	
WAYPOINT	COORDINATE	COMPUTED BEARING (TRUE)	MAGNETIC VARIATION	COMPUTED BEARING (MAG)	DESIGNED BEARING (MAG)	COMPUTED DISTANCE (NM)	RUNWAY DISTANCE (NM)	CHECKLISTS	
THRESHOLD	N							APPROACH PLATE	
	E							TOPOGRAPHIC MAP	
DEPARTURE END	N							WEATHER FORECAST	
	E							D. PREDICTION	
B. WAYPOINT VERIFICATION BY PROCEDURE DESIGNER								NO. OF AVAILABLE SATS	
LEG	SAT / UNSAT	COMPUTED BEARING (TRUE)	MAGNETIC VARIATION	COMPUTED BEARING (MAG)	DESIGNED BEARING (MAG)	COMPUTED DISTANCE (NM)	RUNWAY DISTANCE (NM)	HDOP	
IAWPL-IWP								E. NAV DATABASE	
IAWPR-IWP								FMS PROGRAMMED	
IAWPC-IWP								AFIS PROGRAMMED	
IWP-SDWP								ACCURATE WP / TRACKS	
IWP-FAWP								NO WP REPEATED	
FAWP-SDWP								F. COORDINATION	
FAWP-MAWP								ATC COORDINATION	
MAWP-MATWP								APPENDIX 1 COMPLETED	
MATWP-MAHWP								APPENDIX 2 COMPLETED	
								OTHERS (IF ANY)	
REMARK									
[NOTES / "SEE ATTACHMENT" / "NONE"]									
9. IN-FLIGHT VALIDATION									
A. WAYPOINT VERIFICATION BY FMS AVIONICS							B. WAYPOINT VERIFICATION DURING FLIGHT		C. OBSTACLE VERIFICATION DURING FLIGHT
LEG	SAT / UNSAT	WPTS	ACTUAL DIST	DESIGNED DIST	ACTUAL TK	DESIGNED TK			
INITIAL L							IAWPL		INITIAL L
INITIAL R							IAWPR		INITIAL R
INITIAL C							IAWPC		INITIAL C
INTERMEDIATE							IWP		INTERMEDIATE
FINAL							SDWP		FINAL
MISSED							FAWP		MISSED

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Appendix O to the Report on Agenda Item 3.4

APPROACH									MAWP	APPROACH CIRCLING
D. MISSED APPROACH WAYPOINT VERIFICATION									REMARK [NOTES / "SEE ATTACHMENT" / "NONE"]	
COORDINATE	N		E		XTD NM					
10. POST-FLIGHT VALIDATION										
A. INTERFERENCE VALIDATION					B. SUITABILITY OF PROCEDURE					
LEG	HDOP	NO.OF SAT	RAIM STATUS	DESCENT GRADIENT						
INITIAL L				SEGMENT LENGTH						
INITIAL R				ALIGNMENT ON FINAL						
INITIAL C				GRADIENT / ALIGNMENT COMBO						
INTERMEDIATE				ACCEPTABLE PILOT WORKLOAD						
FINAL				REMARK [NOTES / "SEE ATTACHMENT" / "NONE"]						
MISSED APPROACH										
DEPARTURE										
11. CERTIFIED FOR		LNAV APPROACH TO						FEET ABOVE RUNWAY		
		LNAV / VNAV APPROACH TO						FEET ABOVE RUNWAY		
12. VALIDATION SUMMARY		COORDINATE SURVEY		OBSTACLE CLEARANCE		SIGNAL COVERAGE		OPERATIONAL SUITABILITY		
		WAYPOINT VERIFICATION		MAWP VERIFICATION		INTERFERENCE VALIDATION		AFIS PRINTOUT		
13. FLYABILITY						14. NOTAM				
15. DISCREPANCIES AND/OR REMARKS [NOTES / "SEE ATTACHMENT" / "NONE"]									CORRECTED	
									YES	NO
FLIGHT INSPECTOR			PANEL OPERATOR			PROCEDURE DESIGNER				
ENGINEERING MANAGER, FLIGHT INSPECTION AND SERVICES DEPARTMENT								[DD-MMM-YYY]		
APPROVED BY DEPARTMENT OF CIVIL AVIATION THAILAND										

APANPIRG/20
Appendix P to the Report on Agenda Item 3.4

UPDATED ADS-B SUBJECT/TASKS LIST

No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Action to be taken and led by
1	Conduct study and present a paper on a study for the use of ADS-B technology in airspace in the North Asia.	D. Efficiency	GPI01/02/05/06/07/09/14/16/17/21/22	Report of study for the use of ADS-B in North Asia area	Completed (04/2008)	IATA
2	Report Organizational Policy on ADS-B data sharing with neighbors.	A. Safety D. Efficiency	GPI01/02/05/06/07/09/10/11/14/16/17/21/22	Status report	Completed (04/2008)	All Members
3	Each State report on the number of airframes fitted and transmitting with good NUC/NIC.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Report on statistics conducted	10/2009	All Members with Ground Stations
4	Develop draft comparison of surveillance technologies document including required site and network architecture, expected surveillance coverage, cost of system.	D. Efficiency	GPI01/02/05/06/07/09/14/16/17/21/22	A regional guidance material for implementation	Completed (4/2007)	Greg Dunstone
5	Develop draft update to AIGD to incorporate multilateralization.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	The second amendment to the AIGD	Completed (4/2007)	Nick King, Chainan Chaisompong & Howard Anderson
6	Provide a paper with an update on available equipment standards: (ARINC, Eurocae, RTCA, ICAO, TSO)	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	An information document for implementation	10/2009	USA- seek updates from Home
7	Develop a table detailing readiness of Airspace users & ATS providers.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Report of a survey conducted	Completed (4/2007)	Singapore
8	Provide details of potential areas (FIRs) that where there is a positive cost/benefit for near term implementation of ADS-B Out	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Report of result of studies	Completed (4/2008)	All -Corner meetings

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Appendix P to the Report on Agenda Item 3.4

No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Action to be taken and led by
9	Develop a paper on how Probability of detection should be reported for ADS-B so that it can be compared to radar probability of detection	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Completed (4/2008)	
10	Develop guidelines on how ADS-B equipage should be reported in future, especially the definition of "equipped".	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidelines for implementation	Completed (4/2008)	Greg Dunstone
11	Develop outline of the performance criteria and identify issues to be considered when introducing ADS-B into an Air Traffic Control multi-sensor fusion process	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Completed (4/2008)	Rick Castaldo, Greg Dunstone Michel G. Procoudine
12	Develop brief guidance paper on security issues associated with ADS-B	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Completed (4/2008)	Patrick Souchu, Greg Dunstone, Mike Gahan
13	Exam the feasibility of the use of ADS-B for height monitoring	A. Safety	GPI01/05/06/09/14/16/17/21/22	Result of feasibility study - Advice on ADS-B capability to RVSM Groups.	Completed the advice material (4/2008)	TBD
14	Guidance material on how to build safety case for delivery of separation services.	Safety	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Apr-10	Australia
15	Guidance material on display of ADS-B tracks on displays.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidelines for implementation	Apr-10	Australia
16	Sample mandate material defining ADS-B avionics including the positional data source including task by 45th DGCA Conference.	A. Safety	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Apr-10	Australia
17	Guidance on legal liability issues for ADS-B data sharing.	A.Safety	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Apr-10	U.S.A.
18	Develop and implement regional collaboration project for ADS-B Out operational use including data sharing in SEA and report on implementation progress	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Sub-regional ADS-B collaboration project has been .	Jul-08/ Dec-10	SEA WG

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Appendix P to the Report on Agenda Item 3.4

No.	Subject/Tasks List	Associated with Strategic Objective	Associated GPI	Deliverables	Target Date	Action to be taken and led by
19	Develop and implement regional collaboration project for ADS-B out operational use including data sharing in South Pacific and report on implementation progress	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Develop and implement sub-regional ADS-B collaboration project.	Apr-09/ Dec-11	South Pacific States
20	Develop common compliance procedures for regulatory surveillance of ADS-B avionics installations and operation.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Sample document	Completed (5/2009)	Australia
21	Study application of ADS-B and multilat for precision runway monitoring.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Guidance material for implementation	Apr-10	All Members
22	Perform data collection and data analysis of ADS-B messages to examine GPS performance in different geographic areas.	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Report of data collected and analyzed - continuous	Apr-10	All Members
23	Provide feedback to the proposed amendment to sample service agreement for datasharing	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Comments	April-10	All Members
24	Develop and implement regional collaboration project for ADS-B out operational use including data sharing in Bay of Bengal area and report on implementation progress	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Develop and implement sub-regional ADS-B collaboration project.	Apr-09/ Dec-11	Bay of Bengal States
25	Working Paper for CNS/MET/SG/13 on the need for global harmonized equipage requirements for ADS-B surveillance service in NRA	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Working Paper	June-09	member from USA
26	Provide feedback to the proposed amendment and template for datasharing based on experience gained by Indonesia and Singapore (Appendix H to the report)	D. Efficiency	GPI01/05/06/09/14/16/17/21/22	Comments	April-10	All Members

TABLE CNS-4 A – SURVEILLANCE SYSTEMS

Explanation of the Table

Column

1	Name of country and location of the facility or FIR
2	Air Traffic Services Unit served by the facility
3	PSR – Primary Surveillance Radar
4	Coverage of Primary Surveillance Radar in nautical miles
5	SSR – Secondary Surveillance Radar and Modes implemented will be indicated within Brackets, namely Mode A, C & S
6	Coverage of Secondary Surveillance Radar and/or ADS-B in nautical miles
7	ADS-B Automatic Dependent Surveillance Broadcast
8	ADS-C Automatic Dependent Surveillance Contract
9	SMR – Surface Movement Radar
10	A-SMGCS – Advanced Surface Movement Guidance and Control System
11	PAR – Precision Approach Radar
12	Remarks

Note:

The following codes are used in columns 3, 5, 7, 8, 9, 10, 11 and 12

I - required and implemented

for column 5, I - stands for implementation using conventional SSR while

MI - stands for implementation using Monopulse SSR

X - required but not implemented status not determined

N - required but not implemented

A - existing facility provided to supplement or substitute the requirement

F - future Plan

< - year planned commissioning year to be used as appropriate in conjunction with 'F' & 'N'

> - year planned decommissioning year to be used as appropriate in conjunction with 'A' & 'I'

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
AUSTRALIA											
Hans Tableland	Cairns TUC			MI(A/C)>14 MI(ACS) F<14	250	250 F<10					
	Brisbane EC										
Redden Creek	CairnsACC	I	50	MI(A/C)>08 MF(A/C/S)F<10	250	250F<12					
	Cairns APP Cairns TWR										
Tabletop	Brisbane ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Swampy Ridge	Brisbane ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Mount Alma	Brisbane ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Mount Hardgrave	Brisbane ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
	Coolangatta APP Coolangatta TWR										
Brisbane Airport	Brisbane APP	I	50	MI(A/C)>08 MF(A/C/S)<10	250	250 F<12					
	Brisbane TWR										
Mount Sommerville	Coolangatta APP Coolangatta TWR	I	50	MI(A/C/S	250	250 F<12					
Round Mountain	Brisbane ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
	Sydney APP										
Mount Boyce	Melbourne ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
	Sydney APP Brisbane ACC Melbourne ACC										
Sydney Airport	Sydney APP	I	50	MI(A/C)>08 MF(A/C/S)<10	250	250F<12					
	Sydney TWR							I			

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Mount Majura	Canberra APP	I	50	MI(A/C)>08 MF(A/C/S)F<10	250	250F<12					in Melbourne
Mount Bobbara	Canberra TWR Melbourne ACC (in Melbourne) Canberra APP Canberra TWR			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Mount Macedon	Melbourne ACC Melbourne APP Melbourne TWR			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Gellibrand Hill	Melbourne ACC Melbourne APP Melbourne TWR	I	50	MI(A/C/S)	250	250F<12					
Summertown	Adelaide ACC Adelaide APP Adelaide TWR Melbourne ACC			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Adelaide Airport	Adelaide ACC Adelaide APP Adelaide TWR	I	50	MI(A/C)>08 MF(A/C/S)F<10	250	250 F<12					
Kalamunda	Perth ACC Perth APP Perth TWR			MI(A/C)>14 MI(ACS)F<14	250	250 F<10					
Perth Airport	Perth ACC Perth APP Perth TWR	I	50	MI(A/C)>08 MF(A/C/S)F<10	250	250F<12					
Darwin (military ATC facility)	Brisbane ACC			MI(A/C)	160						SSR data only
Tindal (military ATC facility)	Brisbane ACC			MI(A/C)	250						SSR data only

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Oakey (military ATC facility)	Brisbane ACC			MI(A/C)	250						SSR data only
East sale (military ATC facility)	Melbourne ACC			MI(A/C)	250						SSR data only
Darwin	Brisbane ACC			MI(A/C)>14 MI(ACS) F<14	250	250 F<10					
Bundaberg	Brisbane ACC				250	I					
Balgo Hill	Brisbane ACC				250	FF<2009					
Caiguna	Melbourne ACC				250	I					
Doongan	Brisbane ACC				250	FF<2009					
Esperance	Melbourne ACC				250	I					
Jackson	Brisbane ACC				250	FF<2009					
Thursday Island	Brisbane ACC				250	I					
Ayers Rock AP	Melbourne ACC				250	FF<2009					
Birdsville	Melbourne ACC				250	FF<2009					
Broken Hill	Melbourne ACC				250	I					
Mornington Island	Brisbane ACC				250	FF<2009					
West Gap (Alice Springs)	Brisbane ACC				250	I					
Warburton	Melbourne ACC				250	FF<2009					
Broome	Brisbane ACC				250	FF<2009					
Leonora	Brisbane ACC				250	I					
Longreach	Brisbane ACC				250	I					
Telfer	Brisbane ACC				250	I					
Meekatharra	Brisbane ACC				250	I					

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Mount Isa (DCA Hill)	Brisbane ACC				250	FF<2009					
Newman	Brisbane ACC				250	I					
Oodnadatta	Brisbane ACC				250	FF<2009					
Tennant Creek	Brisbane ACC				250	I					
Karratha	Brisbane ACC				250	I					
Billabong	Melbourne ACC				250	I					
Gove	Melbourne ACC				250	FF<2009					
Bourke	Melbourne ACC				250	I					
Nullabor	Melbourne ACC				250	FF<2009					
Woomera	Melbourne ACC				250	I					
TAS WAM Multilat	Melbourne ACC				100	FF<2009					MLAT F<2010
Sydney Airport	Sydney TCU				40	F<2010				I	MLAT F<2010
BANGLADESH Dhaka	Dhaka APP			I(A/C)	200						
BHUTAN											
BRUNEI DARUSALAM Brunei Airport	Brunei APP	I	80	I(A/C)	250						
CAMBODIA				I(A/C)	250						VDPP 2011, VDSV 2010
CHINA Beijing-1	Beijing TWR Beijing APP			MI(A/C)	200						Mode S when required

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Beijing-2	Beijing ACC Beijing TWR Beijing APP Beijing ACC	I	60	MI(A/C)	200						
Beijing-3	Beijing TWR Beijing APP Beijing ACC	I	200	MI(A/C)	250						
Tianjin	Tianjin TWR			MI(A/C)	200						
Shijiazhuang	Shijiazhuang TWR Beijing ACC			MI(A/C)	200						
Taiyuan	Taiyuan TWR Taiyuan ACC	I	60	MI(A/C)	200						
Hohhot	Hohhot TWR, ACC			MI(A/C)	200						
Manbanshan	Hohhot ACC			MI(A/C)	200						
Sunite	Hohhot ACC			MI(A/C)	200						
Guangzhou-1	Guangzhou TWR Guangzhou APP Guangzhou ACC	I	60	MI(A/C)	200						
Guangzhou-2	Guangzhou TWR Guangzhou APP Guangzhou ACC	I	60	MI(A/C)	200						
Guangzhou-3	Guangzhou TWR Guangzhou APP Guangzhou ACC			MI(A/C)	200						
Shenzhen	Shenzhen TWR Guangzhou APP Guangzhou ACC	I	60	MI(A/C)	200						
Shaoguan	Guangzhou ACC			MI(A/C)	200						
Zhuhai	Zhuhai TWR Zhuhai APP Zhuhai ACC	I	60	MI(A/C)	200						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Sanya	Sanya TWR Sanya APP Sanya ACC	I	150	MI(A/C)	250						
Sanya-2	Sanya TWR,APP,ACC			MI(A/C)	250						
Haikou	Haikou TWR Haikou ACC	I	60	MI(A/C)	200						
Changsha	Changsha TWR Changsha ACC	I	60	MI(A/C)	200						
Changsha-2	Changsha TWR, ACC			MI(A/C)	200						
Enshi	Enshi TWR Wuhan ACC			MI(A/C)	200						
Wuhan	Wuhan TWR Wuhan ACC	I	60	MI(A/C)	200						
Wuhan-2	Wuhan TWR , ACC			MI(A/C)	200						
Zhengzhou-1	Zhengzhou TWR Zhengzhou ACC	I	60	I(A/C)	200						
Zhengzhou-2	Zhengzhou TWR Zhengzhou ACC	I	60	MI(A/C)	200						
Zhoukou	Zhengzhou ACC			MI(A/C)	200						
Guilin -1	Guilin TWR Guilin ACC			I(A/C)	200						
Guilin - 2	Guilin TWR Guilin ACC	I	60	MI(A/C)	200						
Nanning	Nanning TWR Nanning ACC			MI(A/C)	200						
Zhanjiang	Zhanjiang TWR Zhanjiang ACC			I (A/C)	200						
Shantou	Shantou TWR Shantou ACC	I	60	MI(A/C)	200						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Jieyang	Shantou TWR Shantou ACC			MI(A/C)	200						
Kunming	Kunming TWR Kunming ACC	I	60	I(A/C)	200		I				
Chengdu	Chengdu TWR Chengdu ACC	I	60	I(A/C)	200		I				
Guiyang - 1	Guiyang TWR Guiyang ACC			I(A/C)	200						
Guiyang - 2	Guiyang TWR Guiyang ACC	I	60	MI(A/C)	200						
Chongqing	Chongqing TWR Chongqing ACC	I	60	MI(A/C)	200						
Shanghai-1	Shanghai TWR Shanghai APP Shanghai ACC	I	60	MI(A/C)	200						
Shanghai-2	Shanghai TWR Shanghai APP Shanghai ACC	I	60	I(A/C)	200						
Jinan	Jinan TWR, ACC			MI(A/C)	200						
Jinan-2	Jinan TWR, ACC			MI(A/C)	200						
Qingdao	Qingdao TWR Qingdao ACC			MI(A/C)	200						
Hefei	Hefei TWR Hefei ACC	I	60	MI(A/C)	200						
Nanjing	Nanjing TWR Nanjing ACC	I	60	MI(A/C)	200						
Lianyungang	Lianyungang TWR Lianyungang ACC			MI(A/C)	200						
Xuzhou	Xuzhou TWR			MI(A/C)	200						
Hangzhou	Hangzhou TWR Hangzhou ACC	I	60	MI(A/C)	200						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Nanchang	Nanchang TWR Nanchang ACC	I	60	I(A/C)	200						
Nanchang-2	Nanchang TWR, ACC			I(A/C)	200						
Ganzhou	Nanchang ACC			MI(A/C)	200						
Shangrao	Nanchang ACC			MI(A/C)	200						
Fuzhou	Fuzhou TWR Fuzhou ACC	I	60	MI(A/C)	200						
Wenzhou	Wenzou TWR			MI(A/C)	200						
Xiamen	Xiamen TWR Xiamen ACC	I	60	MI(A/C)	200						
Xiamen	Xiamen TWR, ACC			MI(A/C)	200						
Shenyang	Shenyang TWR Shenyang ACC	I	60	MI(A/C)	200						
Shenyang-2	Shenyang TWR Shenyang ACC	I	60	MI(A/C)	200						
Dalian	Dalian TWR Dalian ACC	I	60	I(A/C)	200						
Dalian-2	Dalian TWR, ACC			MI(A/C)	200						
Harbin	Harbin TWR Harbin ACC	I	60	MI(A/C)	200						
Xi'an	Xi'an TWR Xi'an ACC	F<2000	60	I(A/C)	200						
Lanzhou	Lanzhou TWR Lanzhou ACC			MI(A/C)	200		I				
Urumqi	Urumqi TWR Urumqi ACC	I	60	MI(A/C)	200		I				
HONG KONG, CHINA Beacon Hill	Hong Kong ACC Hong Kong APP			MI(A/C)	250						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Mount Parker	Hong Kong TWR Hong Kong ACC Hong Kong APP Hong Kong TWR	I	200	MI(A/C)	250						
Tai Mo Shan	Hong Kong ACC Hong Kong APP Hong Kong TWR	I	140	MI(A/C)	250						
Sha Chau	Hong Kong APP Hong Kong TWR	I	80	MI(A/C)	250						
Hong Kong Int'l Airport	Hong Kong APP Hong Kong ACC Hong Kong TWR					F<2013		I	I		PRM I in 2000
MACAO, CHINA Macao	Macao TWR			MI(A/C)	200			F<2010			
COOK ISLANDS											
DPR KOREA Pyongyang	Pyongyang ACC Pyongyang APP Pyongyang TWR	I	60	MI(A/C) MI(A/C)	200 200					I	
FIJI	Naid ACC Nadi APP					F<2010 F<2010	I				
FRENCH POLYNESIA	Tahiti ACC Tahiti APP			N<2008(A/C) N<2008(A/C)	250	F<2012	I				
INDIA Ahmadabad		I	60	MI	256						
Trivandrum		I	60	MI	256						
Hyderabad		I	60	MI	256						
Guwahati		I	60	MI	256						
Kolkata		I	60	MI	256		I				

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Chennai		I	60	MI	256		I				RSR=220NM "
Delhi		I	60/220	MI	256		I				
Mumbai		I	60/220	MI	256		I	F			
Mangalore				MI	256						
Berhampur				MI	256						
Varanasi				MI	256						
Nagpur				MI	256						
INDONESIA											
Banda Aceh	Medan ACC Jakarta ACC			I(A/C) MI (A/C)	240 240	I 2008					Pre-operation, ADS-B not integrated to ATC system
Medan	Medan APP Jakarta ACC	I	90	MI(A/C)	240	I <2008					
Natuna	Jakarta ACC			I(A/C)	240						
Tanjung Pinang	Tanjung Pinang APP Jakarta ACC	I	90	I(A/C)	240	I<2008					
Pontianak	Pontianak APP Jakarta ACC	I	90	I(A/C)	240	I<2008					
Pekanbaru	Pekanbaru APP Medan ACC Jakarta ACC	I	90	I(A/C)	240	I<2008					
Palembang	Palembang APP Jakarta ACC	I	90	MI(A/C)	240	I 2008					
Jakarta/Cengkareng	Jakarta APP Jakarta ACC Jakarta FIR	I	90	I(A/C) MI(A/C)	240 240	I 2008 F<2007			F 2010		
							X				

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Jakarta/Halim	Jakarta ACC					F<2007					
Semarang	Ujung Pandang ACC Jarkata ACC			I(A/C)	240	I<2009					
Banjarmasin	Banjarmasin APP Ujung Pandang ACC			MI (A/C)	240	I<2009					
Balikpapan	Balikpapan APP Ujung Pandang ACC	I	90	MI(A/C)	240	I<2009					
Yogyakarta	Yogyakarta APP Ujung Pandang ACC Jakarta ACC	I	90	MI(A/C)	240						
Surabaya	Surabaya APP Ujung Pandang ACC Jakarta ACC	I	90	MI(A/C)	240	I<2009			F 2011		
Bali	Bali APP Ujung Pandang ACC	I	90	MI(A/C)	240	I<2009			F 2011		
Waingapu	Ujung Pandang ACC			I(A/C)	240	I<2008					
Ujung Pandang	Ujung Pandang APP Ujung Pandang ACC Ujung Pandang FIR	I	90	I(A/C) I(A/C)	240 240	I<2008 F<2007			F 2011		ADS-C Trial ADS-B Trial
Manado	Ujung Pandang ACC			I(A/C)	240	I<2010					
Ambon	Ujung Pandang ACC			I(A/C)	240	I<2008					
Kendari	Ujung Pandang ACC			I(A/C)	240	I<2010					
Biak	Biak APP Ujung Pandang ACC			I(A/C)	240	I<2010					
Jayapura	APP ACC	2009									
Kupang	APP ACC					I<2010					

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Tarakan	ACC	F<2010				I<2009					
Batam	APP				F(S)<2009	I<2009					
	ACC				F(S)<2009						
Sorong	ACC				F(S)<2009	I<2008					
JAPAN											
Narita Airport	Narita TWR					F<2009		I			
Haneda Airport	Haneda TWR							I			
Nagoya Airport	Nagoya TWR							I			
Osaka Airport	Osaka TWR							I			
Kansai Airport	Kansai TWR							I			
Naha Airport	Naha TWR Naha APP	I	60	I(A/C)	60			I			
Hakodate Airport	Hakodate APP	I	60	I(A/C)	60						
Sendai Airport	Sendai APP	I	60	I(A/C)	60						
Narita Airport - 1	Narita APP	I	60	I(A/C)	60						
Narita Airport - 2	Narita APP	I	60	I(A/C)	60						
Handeda Airport - 1	Tokyo APP	I	60	I(A/C)	60						
Handeda Airport - 2	Tokyo APP	I	60	I(A/C)	60						
Niigata Airport	Niigata APP	I	60	I(A/C)	60						
Nagoya Airport - 1	Nagoya APP	I	60	I(A/C)	60						
Nagoya Airport - 2	Nagoya APP	I	60	I(A/C)	60						
Chubu Airport - 1	Chubu APP	I	80	I(A/C)	80						
Chubu Airport - 2	Chubu APP	I	80	I(A/C)	80						
Osaka Airport - 1	Osaka APP	I	80	I(A/C)	80						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Osaka Airport - 2	Osaka APP	I	80	I(A/C)	80						
Kansai Airport - 1	Kansai APP	I	80	I(A/C)	80						
Kansai Airport - 2	Kansai APP	I	80	I(A/C)	80						
Hiroshima Airport	Hiroshima APP	I	60	I(A/C)	60						
Takamatsu Airport	Takamatsu APP	I	60	I(A/C)	60						
Kouchi Airport	Kouchi APP	I	60	I(A/C)	60						
Fukuoka Airport - 1	Fukuoka APP	I	60	I(A/C)	60						
Fukuoka Airport - 2	Fukuoka APP	I	60	I(A/C)	60						
Nagasaki Airport	Nagasaki APP	I	60	I(A/C)	60						
Oita Airport	Oita APP	I	60	I(A/C)	60						
Kumamoto Airport	Kumamoto APP	I	60	I(A/C)	60						
Miyazaki Airprot	Miyazaki APP	I	60	I(A/C)	60						
Kagoshima Airport - 1	Kagoshima APP	I	60	I(A/C)	60						
Kagoshima Airport - 2	Kagoshima APP	I	60	I(A/C)	60						
Naha Airport	Naha APP	I	60	I(A/C)	60						
Shimojishima Airport	Shimojishima APP	I	60	I(A/C)	60						
Kushiro	Sapporo ACC		200	I(A/C)	200						
Yokotsudake	Sapporo ACC	I	200	MI(A/C)	200						
Hachinohe	Sapporo ACC	I	200	I(A/C)	200						
Jobonzan	Sapporo ACC Tokyo ACC	I	200	I(A/C)	200						
Oginojo	Sapporo ACC Tokyo ACC	I	200	MI(A/C)	250						
Yamada	Tokyo ACC	I	200	I(A/C)	200						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Hakone	Tokyo ACC	I	200	I(A/C)	200						
Mikawa	Tokyo ACC	I	200	I(A/C)	200						
Mikuniyama	Tokyo ACC	I	200	I(A/C)	200						
Hirata	Tokyo ACC Fukuoka ACC	I	200	I(A/C)	200						
Imanoyama	Tokyo ACC Fukuoka ACC	I	200	I(A/C) MI(A/C)	200 F(250)						
Kaseda	Fukuoka ACC Naha ACC	I	200	I(A/C)	200						
Sangunzan	Fukuoka ACC	I	200	I(A/C)	200						
Amami	Fukuoka ACC Naha ACC	I	200	I(A/C) MI(A/C)	200 F(250)						
Miyakojima	Naha ACC	I	200	I(A/C)	200						
Yaedake	Naha ACC	I	200	I(A/C) MI(A/C) MI(A/C)	200 F(250) 250						
Iwaki	Tokyo ACC										
Hachijo	Tokyo ACC			MI(A/C)	250						
Fukue	Fukuoka ACC			MI(A/C)	250						
Nihonkai	TBD			MI(A/C)	F(250)						
KIRIBATI											
LAO PDR											
Vientiane	Vientiane APP	I	80								
Vientiane	Vientiane ACC			MI(A/C)	250						
Savannakhet	Vientiane ACC			MI(A/C)	250						
Xieng Kuang	Vientiane ACC			MI(A/C/S)	250	F<2015					

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
MALAYSIA											
Langkawi	Langkawi APP Kuala Lumpur ACC	I	60	MI (A/C)	200						
Subang	Lumpur APP Kuala Lumpur ACC	I	60	MI (A/C)	200		F<2007				
Genting Highlands	Kuala Lumpur ACC			MI(A/C)	200						
Kulala Lumpur (KLIA)	Lumpur APP Kuala Lumpur ACC	I	60	MI(A/C)	200			I			
Johor	Johor Bharu APP Kuala Lumpur ACC	I	60	MI (S)	200						
Kota Bharu	Kota Bharu APP Kuala Lumpur ACC	I I	60 60	MI (S)	200						
Kota Kinabalu	K. Kinabalu APP K. Kinabalu ACC	I	60	MI(A/C)	200						
Kuching	Kuching APP K. Kinabalu ACC	I	60	MI(A/C)	200						
Miri	Miri APP K. Kinabalu ACC Kuching ACC	I	60	MI (A/C)	200						
MALDIVES											
MARSHALL ISLANDS											
MICRONESIA (FEDERATED STATE OF)											
MONGOLIA											
	Ulaanbaatar ACC Ulaanbaatar APP					<2008 <2008	I I				
MYANMAR											
Yangon	Yangon APP Yangon ACC			MI(A/C)	200						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Mandalay	Mandalay APP	I	60	MI(A/C)	200						
NAURU											
NEPAL Kathmandu	Kathmandu APP	I	60	I (A/C)	200						
NEW CALEDONIA	Tontouta ACC Tontouta APP					TBD TBD					
NEW ZEALAND Auckland	Christchurch ACC	I	80								
Auckland OCA	Auckland ACC						I				
Auckland TWR	Auckland TWR							F<2009			
Ballance	Christchurch ACC			I	250						
Cass Peak	Christchurch ACC			I/A/C/S	250						
Christchurch	Christchurch ACC	I	80								MDS Trial 2-8/06
Hawkins Hill	Christchurch ACC	I	80	I	250						
Mount Robertson	Christchurch ACC			I	250						
Queenstown	Christchurch ACC Queenstown TWR										Wide Area MDS planned for Queenstown in 2007
Ruao Tewhenua	Auckland ACC Christchurch ACC			I	250						
Teweraiti	Christchurch ACC			I	250						
PAKISTAN Karachi Airport	Karachi ACC Karachi APP Karachi TWR	I	98	MI(A/C)	200						
Pasni	Karachi ACC			MI(A/C)	200						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Lak Pass	Karachi ACC Lahore ACC			MI(A/C)	200						
Rojhan	Karachi ACC Lahore ACC			MI(A/C)	200						
Lahore Airport	Lahore ACC Lahore APP Lahore TWR	I	98	MI(A/C)	200						
Islamabad Airport	Lahore ACC Islamabad APP Islamabad TWR	I	98	MI(A/C)	200						
PAPUA NEW GUINEA Jacksons airport	Jacksons APP Moresby ACC	I	60	I(A/C)	200						
PHILIPPINES											
Manila	Manila APP	I F<2012	60	I(A/C) M(A/C/S) F<2012	90						
Tagaytay	Manila ACC			MI(A/C/S)	250						
Clark	Clark APP	I	70	MI(A/C)	70						
Mactan	Mactan APP	I F<2012	70	I(A/C)	70						
Kalibo	Kalibo/Caticlan APP	F<2012		M(A/C/S) F<2012							
Bacolod	Bacolod APP	F<2012		M(A/C/S) F<2012							
Davao	Davao APP	F<2012		M(A/C/S) F<2012							
Subic	Subic APP	I	70	I(A/C)	70						
Laoag	Manila ACC Manila ATM Center			MI(A/C) M(A/C/S) F<2012	250 250						

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Aparri	Manila ATM Center			M(A/C/S) F<2012							
Mount Majic	Manila ACC Manila ATM Center			MI(A/C) M(A/C/S) F<2012	250						
Palawan RCAG	Manila ATM Center			M(A/C/S) F<2012							
Zamboanga	Manila ATM Center			M(A/C/S) F<2012							
Manila ATM Center	Manila ATM Center					F<2012					
Puerto Princesa	Manila ATM Center					F<2012					
REPUBLIC OF KOREA											
Jeju	Jeju TWR Jeju APP	I	60	I(A/C)	200			I			
Cheongju	CheongjuTWR										
Incheon-1	Incheon TWR Seoul APP, ACC	I	60	MI(A/C)	200	F<2008		I	I		
Incheon-2	Incheon TWR Seoul APP, ACC	I	60	MI(A/C)	200						
Yangyang	Yangyang TWR										
Gimhae	Gimhae TWR Gimhae APP	I	60	I(A/C)	200			I			
Daegu	Daegu APP	I	60	MI(A/C)	200						
Cheongju	Jungwon APP	I	60	MI(A/C)	200						
Gimpo	Gimpo TWR Gimpo APP, ACC	I	60	MI(A/C)	200			I I	F<2006		
SINGAPORE											
Singapore	Singapore ACC Singapore APP Singapore TWR	I I	220 70	MI(A/C) MI(A/C)	250 200	F<2010	I				

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
	Singapore APP	I	70	MI(A/C)	200						
SOLOMON ISLANDS											
SRI LANKA											
Bandaranaike Airport	Colombo APP	I	90								
Mount Piduruthalagala	Colombo ACC			MI(A/C)	200	F<2010	I				ADS-C trial
THAILAND											
Bangkok	Bangkok APP Bangkok ACC Bangkok TWR	I	80	MI(A/C)	250	F<2010					
Bangkok/ Suvarnabhumi AP	Bangkok APP Bangkok ACC Bangkok/SVB TWR	I	80	MI(A/C/S)	250			I	I		A-SMGCSLevel2
Chiang Mai	Chiang Mai APP Bangkok ACC	I>2010	60	MI(A/C)>2010 F(A/C/S)<2010	250 250						
Ubon Rachathani	Bangkok ACC			MI(A/C)>2009 F(A/C/S)<2009	250 250						
Surat Thani	Bangkok ACC Hat Yai APP Phuket APP			MI(A/C)>2009 F(A/C/S)<2009	250 250						
Hat Yai	Hat Yai APP Bangkok ACC	I>2010	60	F(A/C/S)<2010	250						
Phuket	Phuket APP	I>2009	60	F(A/C/S)<2009	250						
Phitsanulok	Phitsanulok APP	I	60								
Hua Hin	Hua Hin APP	I	60								
U Taphao (Military Installation)	U Taphao			I(A/C)	200						
TONGA						F<2010					

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
UNITED STATES											
Alaska	ACC					2003	I<2006				
Hilo, Hawaii	ACC APP TWR	I	60	I(A/C)	200						
Honolulu, Hawaii	ACC APP TWR	I	60	I(S)							
Kahului, Hawaii	APP TWR	I	60	I(A/C)							
Kokee, Hawaii	ACC	I	200								
Lihue, Hawaii	APP TWR	I	60	I(A/C)							
Mount Kaala, Hawaii	ACC	I	200	I(A/C)							
Pahoa, Hawaii	ACC			I(A/C)							
Kunianiau, Hawaii	ACC			I(A/C)							
Guam	ACC	I	200	I(A/C)							
Mount Santa Rosa, Guam	APP TWR	I	60	I(A/C)							
Mount Santa Rosa, Guam	ACC	I									
Kona, Hawaii	ACC			F(A/C)	200						
Mount Kaala, Hawaii	ACC	F	250								
Mount Santa Rosa, Guam	ACC	F<2000	250	F(S)<2000	250						
VANUATU											
VIET NAM											
Hanoi/Noibai	Hanoi ACC Noibai APP Noibai TWR	I	80	MI(A/C) MI (A/C)	200 250	F<2013					
								F<2011	F<2011		

TABLE CNS 4A - SURVEILLANCE SYSTEMS

Country/Location	ATS Units Served	PSR	Coverage of PSR (NM)	SSR(A/C/S)	Coverage of SSR/ADS-B (NM)	ADS-B	ADS-C	SMR	A-SMGCS	PAR	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Danang/Sontra	Ho Chi Minh ACC Danang APP Hanoi ACC	I I	80 80	MI (A/C)	250						
Qui Nhon	Ho Chi Minh ACC Danang APP Hanoi ACC			MI (A/C)	250						
Ca Mau	Ho Chi Minh ACC			MI (A/C)	250						
Nghe An/Vinh	Hanoi ACC			MI (A/C)	250						
Tansan Nhat	Tansan Nhat APP Ho Chi Minh ACC Tansan Nhat TWR	I F	80	MI (A/C)	250	F<2011	I (2006)	F<2012	F<2012		F<2010

Table CNS 4B

ATS AUTOMATION SYSTEMS

EXPLANATION OF THE TABLE

Column

1	Name of State/Territory and location of ATS automation systems within the State
2	Air traffic services unit served by the ATS automation systems
	AACC — Area approach control centre
	ACC — Area control
	APP — Approach control
	EC — En-route centre
	FIS — Flight information service
	SMC — Surface movement control
	TCU — Terminal control unit
	TMA — Terminal control area
	TWR — Tower control
3	Surveillance sensor linked to the ATS automation systems. Four-letter FIR identifier, enclosed in parenthesis, shown for surveillance sensors outside the FIR.
4	Radar data processing system
5	Flight data processing system
6	Minimum safe altitude warning system
7	Automatic dependent surveillance
	ADS B — Automatic dependent surveillance broadcast
	ADS C — Automatic dependent surveillance contract
8	Controller-pilot data link communications
9	ATS interfacility data link communications
10	Processing area of the radar data processing system in nautical miles
11	Number of ATS positions

12 Remarks

Note.— The following codes are used in columns 4 to 11:

I — Required and implemented

X — Required but implementation status not determined

N — Required but not implemented

A — Existing facility provided to supplement or substitute the requirement

F — Future plan

< Year — Planned commissioning year, to be used as appropriate in conjunction with “F” and “N”

> Year — Planned decommissioning year, to be used as appropriate in conjunction with “A” and “I”

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CNS

IV-CNS 4B-3

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
AUSTRALIA											
Adelaide	TCU TWR	Adelaide PSR/SSR Summertown SSR	I	I	I	**	**	F<2011	Maximum 2600x3000	5	** Available – not used
Brisbane	EC	Brisbane PSR/SSR Darwin SSR Tindal SSR Mt. Alma SSR Mt. Boyce SSR Mt. Hardgrave SSR Mt. Somerville SSR Oakey SSR Sydney PSR/SSR Tabletop Mt. SSR The Round Mountain SSR	I	I	I				Maximum 2600x3000 2600x3000	47	
Brisbane	Brisbane and Coolangatta TMA's TWR	Brisbane PSR/SSR Mt. Boyce SSR Mt. Hardgrave SSR Mt. Somerville SSR Oakey SSR	I	I	I	**	**	F<2011	Maximum 2600x3000	8	
Cairns	TCU TWR	Hann's Tableland SSR Redden Creek PSR/SSR	I	I	I	**	**	F<2011	Maximum 2600x3000	5	
Melbourne	EC	Brisbane PSR/SSR Darwin SSR Tindal SSR Mt. Alma SSR Mt. Boyce SSR Mt. Hardgrave SSR Mt. Somerville SSR Oakey SSR Sydney PSR/SSR Tabletop Mt. SSR The Round Mountain SSR	I	I	I				Maximum 2600x3000	45	
Melbourne	Melbourne and Canberra TMA's TWRs	Gellibrand Hill PSR/SSR Adelaide SSR East Sale SSR Mt. Bobbara SSR Mt. Boyce SSR Mt. Macedon SSR Mt. Majura SSR Sydney SSR Summer town SSR	I	I	I	**	**	F<2011	Maximum 2600x3000	10	
Perth	TCU	Perth PSR/SSR Kalmunda SSR	I	I	I	**	**	F<2011	Maximum 2600x3000	I	

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IV-CNS 4B-4

ASIA/PAC FASID

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
	TWR										
Sydney	TCU TWR	Sydney PSR/SSR Mt. Boyce SSR Mt. Bobbara	I	I	I	**	**	F<2011	Maximum 2600x3000	6	
Sydney	TWR	Sydney surface movement radar	I						Aerodrome precincts	5	
Sydney	TCU	Parallel approach runway monitor	I						Sydney 34L & R and 16L & R approaches	2	
BANGLADESH											
BHUTAN											
BRUNEI DARUSSALAM											
Berakas			<1997	<1997					512x512		
Brunei	APP		2						150x150		
CAMBODIA											
CHINA											
Beijing	APP ACC		2						1024x1024		
Changchun	APP		2						1024x1024		
Changsha	APP		2						1024x1024		
Chengdu	APP ACC		2						1024x1024		
Chongqing	APP		2						1024x1024		
	ACC										
Dalian	APP ACC		2						1024x1024		
Fuzhou	APP		2						1024x1024		
	ACC										
Guangzhou	APP ACC		2						1024x1024		
Guilin	APP		2						1024x1024		
	ACC										
Guiyang	APP ACC		2						1024x1024		
Haikou	APP		2						1024x1024		
Hangzhou	APP		2						1024x1024		
	ACC										

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CNS

IV-CNS 4B-5

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Harbin	APP		2						512x512		
	ACC										
Hefei	APP		2						1024x1024		
	ACC										
Hohhot	APP		2						1024x1024		
	ACC										
Jinan	APP		2						1024x1024		
	ACC										
Kunming	APP ACC		2						1024x1024		
Lanzhou	APP		2						1024x1024		
	ACC										
Lianyungang	APP		2						512x512		
Nanchang	APP ACC		2						1024x1024		
Nanjing	APP		2						512x512		
	ACC										
Qingdao	APP		2						1024x1024		
	ACC										
Sanya	APP		2						512x512		
	ACC										
Shanghai	APP ACC		2						1024x1024		
Shantou	APP		2						1024x1024		
	ACC										
Shenzhen	Shenzhen APP ACC Guangzhou APP ACC		2						1024x1024		
Shenyang	APP		2						1024x1024		
	ACC										
Shijiazhuang	APP		2						1024x1024		
Tianjin	APP		2						1024x1024		
Taiyuan	APP		2						1024x1024		
	ACC										
Urumqi	APP		2						1024x1024		
	ACC										
Wenzhou	APP		2						512x512		
	ACC										
Wuhan	APP		2						1024x1024		

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IV-CNS 4B-6

ASIA/PAC FASID

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
	ACC										
Xi'an	APP ACC		2						1024x1024		
Xiamen	APP ACC		2						1024x1024		
Zhanjiang	APP		2						1024x1024		
Zhengzhou	APP ACC		2						1024x1024		
Zhuhai	APP		2						1024x1024		
COOK IS.											
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA											
	APP ACC		1						Radius 200	6	
FIJI											
Nadi	ACC			I		ADSC-I ADSB-F<2010	I	I	250		
FRENCH POLYNESIA (France)											
Tahiti	TWR APP ACC			2							
Tahiti	ACC					ADS-C <1998					
GUAM (United States)											
Anderson	ACC		2						200x200		
HONG KONG, China											
Hong Kong	APP ACC TWR		2	2	2000				250x250		
Hong Kong	ACC					ADS-C <TBA					
INDIA											
Chennai				2		I	I				
Delhi					I						
Kolkata						I	I				
Mumbai					I						
INDONESIA											

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CNS

IV-CNS 4B-7

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Bali	Bali ACC APP	N<2003	2						1024x1024	4	
Jakarta	Jakarta ACC APP Soekarno-Hatta TWR Jakarta FIC	1	2	2	I	I	I	N<2002	2048x2048	40	SSR (Banda Aceh/ Medan/Pekanbaru/ Tanjung Pinang/ Banjarmasin/ Yogyakarta/ Surabaya) Cengkareng MSSR will be connected to RDP F<2000
Medan	Medan ACC	F<2003	2								
Ujung Pandang	Ujung Pandang ACC APP	N<2003	2					N<2003	4036x4036	20	SSR(Balikpupen, Banjarhasin, Maiden, Surabaya, Bali, Waingapu, Kendar, Biak)
JAPAN											
Chubu	APP		2	2					70x70		
Fukuoka	APP		2	2					70x70		
Fukuoka	ACC		2	2					500x800		
Haneda	Tokyo APP		2	2					70x70		
Narita	APP		2	2					70x70		
Okinawa	Naha APP		2	2					360x700		
Osaka	APP		2	2					80x80		
Sapporo	ACC		2	2					500x700		
Tokyo	ACC		2	2					500x875		
KIRIBATI											
LAO PEOPLE'S DEMOCRATIC REPUBLIC											
MACAO, China											
Colanne	Macao TWR		2	2<2010					500x500	3	
MALAYSIA											
Kinabalu	ACC APP TWR		I	I	I				20 000x20 000	3	

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IV-CNS 4B-8

ASIA/PAC FASID

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Kuching	APP ACC TWR		I	I	I				20 000x20 000	3	
Langkawi	APP		I	I	I				20 000x20 000	1	
Subang	Kuala Lumpur ACC APP TWR		I	I	I	F<2002	F<2002		20 000x20 000	11	
MALDIVES											
MARSHALL IS.											
MICRONESIA (FEDERATED STATES OF)											
MONGOLIA											
MYANMAR											
Yangon	APP ACC		2<199 7						440x440		
NAURU											
NEPAL											
Kathmandu	APP		2<199 7			ADS-C <2000					
NEW ZEALAND											
Auckland	Auckland ACC TWR		I	I	<2003	ADS-C I	I	I	5500x2500		
Christchurch	Christchurch ACC TWR Wellington TWR		I	I	<2003				1024x1024		
PAPUA NEW GUINEA											
Port Moresby	ACC		2	2<199 9		ADS-C <2000			200 Radius		
PHILIPPINES											
Laoag	Manila ACC		2	2		ADS-C <TBA			1024x1024		

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CNS

IV-CNS 4B-9

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
Mactan	APP		2			ADS-C <TBA			200x200		
Manila	APP		2			ADS-C <TBA			200x200		
Mt. Majic	Manila ACC		2			ADS-C <TBA			1024x1024		
Subic	APP		2			ADS-C <TBA			200x200		
Tagaytay	Manila APP		2			ADS-C <TBA			1024x1024		
REPUBLIC OF KOREA											
Daegu or Incheon	ACC	8 PSRs/SSRs	3 <2001	3 <2001					Radius 200	6	
Gimhae	APP		2	2	1 (low altitude alert)				60x60	3	
Incheon	APP	2 PSRs/SSRs in Incheon 1 PSR/SSR in Gimpo	2	2	1				60x60	8	
Jeju	APP	PSR/SSR	2	2	1 (low altitude alert)				60x60	3	
SINGAPORE											
Singapore	ACC APP TWR		I	I	I	ADS-C - I	I		1024x1024		
SOLOMON IS.											
SRI LANKA											
Colombo	ACC		2	2<TBA		ADS-C & B TBA			200 Radius		
THAILAND											
Bangkok	APP ACC		2	2		ADS-B <1996			1024x1024		
Chiang Mai	Chang Mai APP Bangkok ACC		2						1024x1024		
Phuket	APP		2						1024x1024		
Hatyai	APP		2						1024x1024		

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IV-CNS 4B-10

ASIA/PAC FASID

State/Territory Location	ATS unit served	Data source	RDP	FDP	MSAW	ADS	CPDLC	AIDC	Processing area (NM)	Operator positions	Remarks
1	2	3	4	5	6	7	8	9	10	11	12
TONGA											
UNITED STATES											
Hilo	APP TWR		2						60x60		
Honolulu	ACC		2	2					500x500		
Honolulu	APP TWR		2						60x60		
VANUATU											
VIET NAM											
Ho Chi Minh	ACC		2	2	I	ADS-C I	I		1024x1024	16	
Hanoi	ACC		2	2	I				1024x1024	8	

**PROPOSED MODIFICATION TO GUIDELINES FOR
THE DEVELOPMENT OF ADS-B IMPLEMENTATION PLAN**

That, States be advised to use the following guidelines for the development of ADS-B implementation plan.

- a) minimize capital and operating costs of ADS-B data facilities;
- b) give priority to provide ADS-B coverage over major traffic flows and *those airspaces currently not covered by radar. ADS-B should have overlapping area with existing radar coverage.*
- c) provide ADS-B coverage in areas within 150 NM from FIR boundaries;
- d) suitable sites with power, shelter, access routes and data communication links shall be preferred; and
- e) overlapping of ADS-B coverage is preferred.
- f) Integrate ADS-B data with the ATM automation system wherever possible taking advantage of synergies with other means of surveillance (such as radar, ADS-C, flight plan tracks) ;
- g) Mandate ADS-B OUT equipage on the aircraft operating in the airspaces, at the flight levels or area where currently no radar surveillance is available and where ADS-B based services are offered (served with ADS-B ground stations).
- h) Expand the “mandate” to aircraft operating in other airspace when the ANSP is able to provide ADS-B based services in the airspace.
- i) ADS-B Implementation is more effective when it is implemented regionally both on the ground and on the aircraft.
- j) When considering the benefits of ADS-B Implementation, it is necessary to consider the total benefits to all stakeholders (airline operators, passengers, efficiency of the ATM network, and society etc) and not only the benefit derived for airlines operators and air navigation services providers.

TABLE FOR SSR MODE S II CODE COORDINATION

<u>Column</u>	<u>Explanation of the Table</u>
1	Name of country/Territory and Location of the facility
2	Coordinates Latitude and Longitude
3	AMSL – Elevation of Radar head above the Means Sea Level in meters
4	Air Traffic Services Unit served by the facility
5	Coverage of SSR Mode S Radar in nautical miles/flight level
6	SIC - System Identifier Code in decimal
7	II Code- Interrogator Identifier in decimal
8	Remarks

Note:

SAMPLE TABLE

State/Territory Location	Coordinates		AMSL	ATS UNIT	Coverage	SIC	II Code	Remarks
			Meter	served	NM/Flt	Decimal	Decimal	
1	2	3	4	5	6	7	8	
Thailand								
Donmuang				Bangkok APP	250	18	2	
				Bangkok ACC				
				Bangkok TWR				
Suvarnabhumi				Bangkok APP	250	34	3	
				Bangkok ACC				
				Bangkok TWR				
Chiang Mai				Chiang Mai APP	250	98	4	
				Bangkok ACC				
Ubonratchathani				Bangkok ACC	250	162	5	
Surathani				Bangkok ACC	250	82	7	
				Hat Yai APP				
				Phuket APP				
Phuket				Phuket APP	250	66	8	
Hatyai				Hat Yai APP	250	50	9	

Planning criteria for SSR Mode S Interrogator Identifier codes

1. Introduction

1.1 In order to selectively interrogate a Mode S equipped aircraft, the ground station needs to know the aircraft's Mode S address and its approximate position. To acquire the address of a Mode S equipped aircraft, the ground station transmits all-call interrogations. A Mode-S equipped aircraft will respond to such interrogations with its unique address. Once the response is received by the ground station, the aircraft will be added to the ground station's file of acquired aircraft – the aircraft is in an "acquired" state.

1.2 Once the aircraft is in the acquired state (i.e. in the list of aircraft of which the Mode S address has been acquired) the aircraft should be instructed to not longer respond to (or "locked out from" Mode S all calls from that particular ground station, in order to minimize all-call synchronous garbling. This is achieved when the aircraft receives Mode S selectively addressed interrogations that contain an instruction to the on-board transponder to not respond to Mode S all call interrogations.

1.3 When an aircraft is within the range of 2 (or more) Mode S ground stations, it must acquire the "lock out" status from each ground station. This is known as multi site acquisition and lock out.

1.4 In order to allow the aircraft to identify the ground station, each Mode S station has been assigned a Interrogator Identifier (II). 15 II codes have been identified. (For aircraft complying with the provisions of Annex 10, Volume IV, Amendment 73 or later an additional 63 codes known as Surveillance Identifier (SI) can be used. This technique is not addressed here). The purpose of the II (or SI) is to prevent aircraft that have been acquired by the SSR interrogator to respond to Mode-S all-call requests from that particular interrogator. These aircraft are "locked out" by the transponder to respond to further Mode-S all-call interrogations.

1.5 Measures must be taken to avoid that aircraft within the coverage of more than one SSR Mode S ground station will receive interrogations with the same Interrogator Identifier. This will be achieved by securing that Mode S ground stations with overlapping coverage have been assigned different Interrogator Identifiers. The assignment of Interrogator Identifier codes should be subject to Regional coordination.

Note: Detailed information is available in Annex 10, Volume IV and the ICAO Manual on the Secondary Surveillance Radar (SSR) Systems (Doc 9684) which has been the main source for the information provided in this material. These ICAO publications are recommended for further consultation and details on the use of SSR Mode S

2 Interrogator Identifier

2.1 The Interrogator Identifier (II) is a four digit code (0 – 15) which is transmitted by the SSR-S interrogator when transmitting a Mode S only all-call (or a Mode S selective) interrogation. It serves the purpose to identify (by the SSR transponder in the aircraft) the SSR-S ground station. The purpose of the II is to prevent aircraft that have been acquired by the SSR interrogator to respond to Mode S all-call requests from that particular interrogator (ground station). These aircraft are "locked out" by the transponder to respond to further Mode-S all-call interrogations.

2.2 A Mode-S only all-call interrogation elicits replies only from Mode S transponders and is used in conjunction with the Mode A/C only all-call interrogation. The (uplink) format for the Mode S only all-call is as follows:

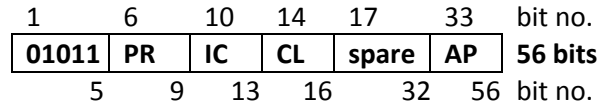


Figure 1

This message contains the following information:

- Bit 1-5 01011 (decimal value 11); defines the uplink format and the content of bits 6 – 56
- Bit 6-9 PR (probability of reply) (this information is not further addressed here)
- Bit 10-13 IC (Interrogator Code). These four bit contain the Interrogator Identifier (0-15) or the last four bits of the Surveillance Identifier (SI) (See paragraph 1.4)
- Bit 14-16 CL (Code Label). If CL=000, the information in the IC field is the Interrogator Identifier. If CL is 001 to 100 (1 to 4), the information in the ICA field is the Surveillance Identifier (See paragraph 1.4).
- Bit 33-56 AP (Address/Parity) For a Mode S only all-call, the address consist of 24 one's, on which the parity is overlaid.

2.3 A Mode S only all-call reply, in which the II (or SI) is encoded in the PI field, has the following format:

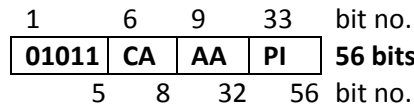


Figure 2

This message contains the following information:

- Bit 1-5 01011 (decimal value 11); defines the downlink format and the contents of bits 6 – 56
- Bit 6-8 CA (Capability) An encoded definition of the communications capability of the transponder
- Bit 9-32 AA (Address Announced) 24 bit aircraft address
- Bit 33-56 PI (Parity / Interrogator Identifier) Interrogator identity code, on which the parity is overlaid

2.4 Following the Mode S only all-call reply, the ground station will send a selective interrogation, which has the following format:

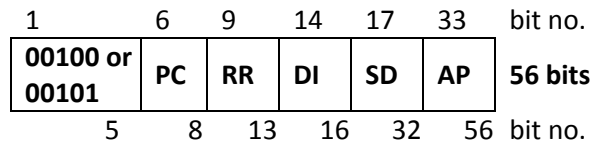


Figure 3

This message contains the following information:

- Bit 1-5 00100 Or 00101 (decimal value 4 or 5); defines the uplink format and the contents of bits 6-56;
4 = altitude request; 5 =identity request
- Bit 6-8 PC (Protocol); if PC=1, the transponder shall commence to lock out
- Bit 9-13 RR (Reply Request); command the length and content of a requested reply
- Bit 14-16 DI (Designator Identification); identifies the structure of the SD field
- Bit 17-32 SD (Special Designator); contains a number of control codes, specific to SSR
- Bit 33-56 AP (Address/Parity); aircraft address on which the parity is overlaid

2.5. The aircraft responds as requested by the selective interrogation.

3. Coordination and operation of adjacent Mode S ground stations

3.1 Coordination is required when adjacent Mode S ground stations have overlapping coverage. This coordination is particularly important where radar coverage crosses national boundaries. The following example illustrates difficulties that may arise if two Mode S stations, with overlapping coverage, use the same Interrogator Identifier.

3.1.1 In Figure 4, an aircraft travelling from A to B will, when entering the coverage area of SSR Mode-S ground station P, in response to regular all-call interrogations, be acquired by ground station P. From there-on, it will only respond to selective interrogations from ground station P. When the aircraft enters into the (overlapping) coverage of SSR Mode-S ground station R (at point F), it will continue to respond to selective interrogations from ground station P and not respond to any interrogation from ground station R. Only after the aircraft has left the coverage of ground station P (point G in Figure 4), and it has not received any selective interrogation for about 18 seconds, the aircraft returns to the “non-acquired” status and responds to Mode-S all-call requests from ground station R and subsequent selective calls from ground station R. This situation is undesirable.

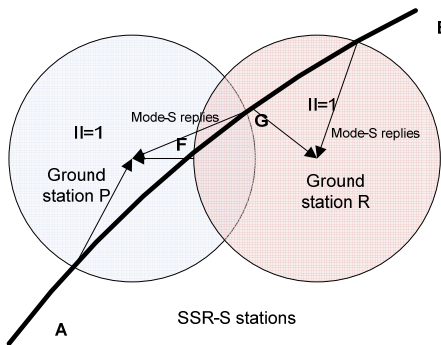


Figure 4

3.1.2 In figure 5, ground station P and ground station R have a different Interrogator Identifier. In this case, an aircraft travelling from A to B will, when entering the coverage area of SSR Mode-S ground station P, in response to regular all-call interrogation, be acquired by ground station P. When entering the coverage of SSR Mode-S ground station R the aircraft will, in response to all-call interrogations from SSR Mode-S ground station R, be acquired by ground station R as well and also respond to selective interrogations from ground station R. on the track between F and G, the aircraft will respond to selective interrogations from ground station P AND ground station R. After leaving the coverage area of ground station P (point G in figure 5) the acquired status of the aircraft with ground station P will be lost.

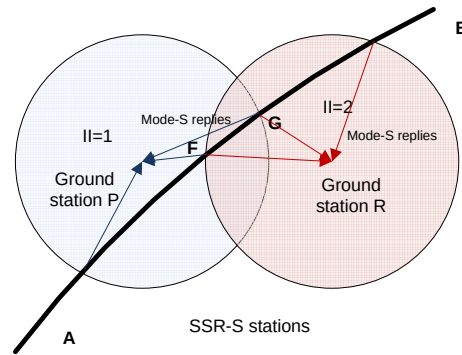


Figure 5

3.1.3 Ground station linking

3.1.3.1 The situation as described in paragraph 3.1.1 above, where the aircraft is not detected by SSR Mode S ground station R on the path between point F and G can be avoided if the two SSR S ground stations share their table of acquired aircraft (in particular the 24 bit aircraft address and the approximate location of the aircraft). In that case, ground station R can send selective interrogations to the aircraft and obtain valid responses. This process, known as ground station linking, will allow for the use of the same Interrogator Identifier by the two ground stations with overlapping coverage areas.

3.1.4 Using multiple Interrogator Identifier codes by a single Mode S ground station.

3.1.4.1 Another method avoiding the aircraft in the example in paragraph 3.1.1 above not being surveyed by ground station R is the use of two interrogator codes by ground station R. In this case, in the sector of one Mode S ground station that is overlapping with another ground station using the same Interrogator Identifier, a different Interrogator Identifier should be used. However, it is not recommended to use more than one Interrogation Identifier by one single Mode S ground station. When multiple Interrogator Identifier codes are used by one single Mode S ground stations, the total number of interrogator codes used by the ground station shall not be more than 2. Also, the different interrogator codes shall not be interleaved (i.e. in different sectors only different Interrogator Identifier codes shall be used).

3.1.5 The above examples illustrates the need for SSR Mode-S ground stations having overlapping coverage, to be assigned a unique II in the area of overlap, except in the case as described in paragraph 3.1.3. The coverage area is assumed to be the maximum distance/height combination within which the aircraft can receive interrogation requests from the Mode-S ground station. This area may be smaller (or bigger) than the actual operational coverage area of the [ACC/FIR] sector in which ATC provides radar services. As a general rule the coverage area of the SSR Mode S ground station coincides with the radio horizon from the aircraft and is actually depending on the aircraft's operating altitude.

4. Interrogator Identifier codes.

4.1 Four bits are available for 16 different Interrogator Identifier codes (see paragraph 2.2 above).

4.1.1 Interrogator Identifier code 0 (zero)

4.1.1.1 Interrogator Identifier code 0 (zero) shall only be used for supplementary acquisition based on lockout override. This code is not available for [regular] Mode S acquisition and lockout purposes

5.2 A more complex example for SSR Mode S Interrogator Identifier code assignments is in Figure 7. It shows that in many cases the Interrogator Identifier codes can be assigned very efficiently. It also shows cases whereby Mode S ground stations are linked, so they can use the same Interrogator Identifier code and a case where one Mode S ground station is assigned two Interrogation Identifier codes

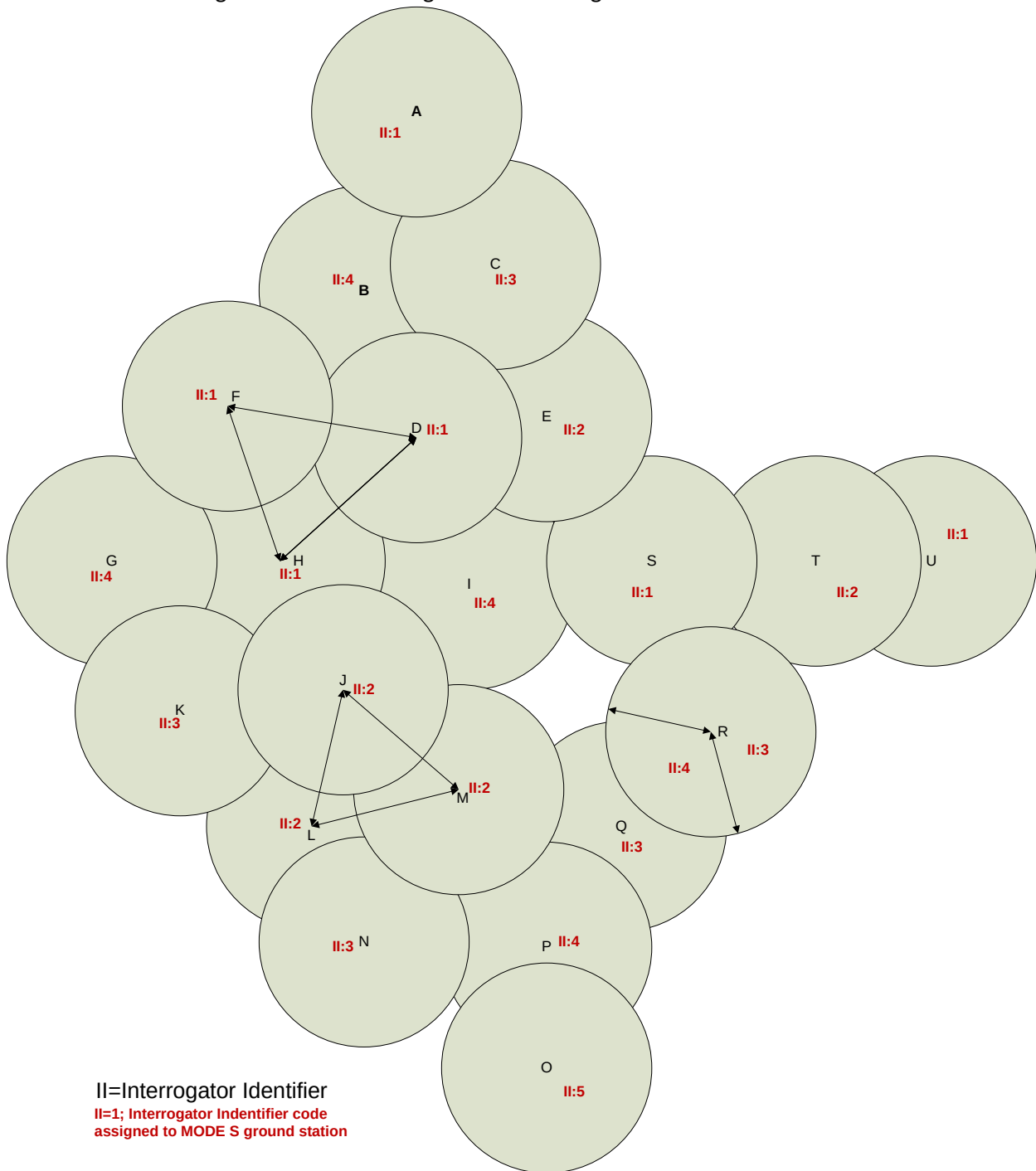


Figure 7

6. Proposed planning parameters for SSR Mode S ground stations.

6.1 DOC of two SSR Mode S ground stations has the same maximum flight level

6.1.1 In Figure 8, SSR Mode S stations P and Q have the same II code assigned. An aircraft travelling from **A** to **B**, will be within the DOC of the SSR Mode S station P and locked out for Mode S All-Calls (it will only respond to selective calls from ground station P). After the aircraft leaves the DOC of ground station P (at **B**), it will continue to be locked out from All-Calls by Mode S ground station P as well as from All-Calls from ground station Q, although it is now within the coverage of ground station Q as well. (The coverage for ground station P is to point C, but the DOC is only to point B). When the aircraft is beyond point C, it will no longer receive signals from SSR Mode S station P (ground station P is beyond the radio horizon of the aircraft) and after 18 seconds, the aircraft SSR Mode S transponder will be unlocked. It will then start responding to All-Calls from SSR Mode S station Q. In this situation, the DOC of station Q can be close to point C (as shown in the drawing).

In this case, the minimum separation of the two SSR Mode S ground stations is equal to the sum of the distance to the radio horizon of the aircraft to ground station P plus the range (as per DOC) of SSR Mode S ground station Q plus a small buffer (10 NM is proposed).

Note: Once the aircraft is not longer receiving selective interrogations from one ground station, it will, after a period of about 18 seconds start, responding to all calls from any Mode S ground station. Assuming the aircraft travels at a speed of about 1000 km/hr., this would result in an aircraft displacement of 2.6 NM (over the period of 18 seconds).

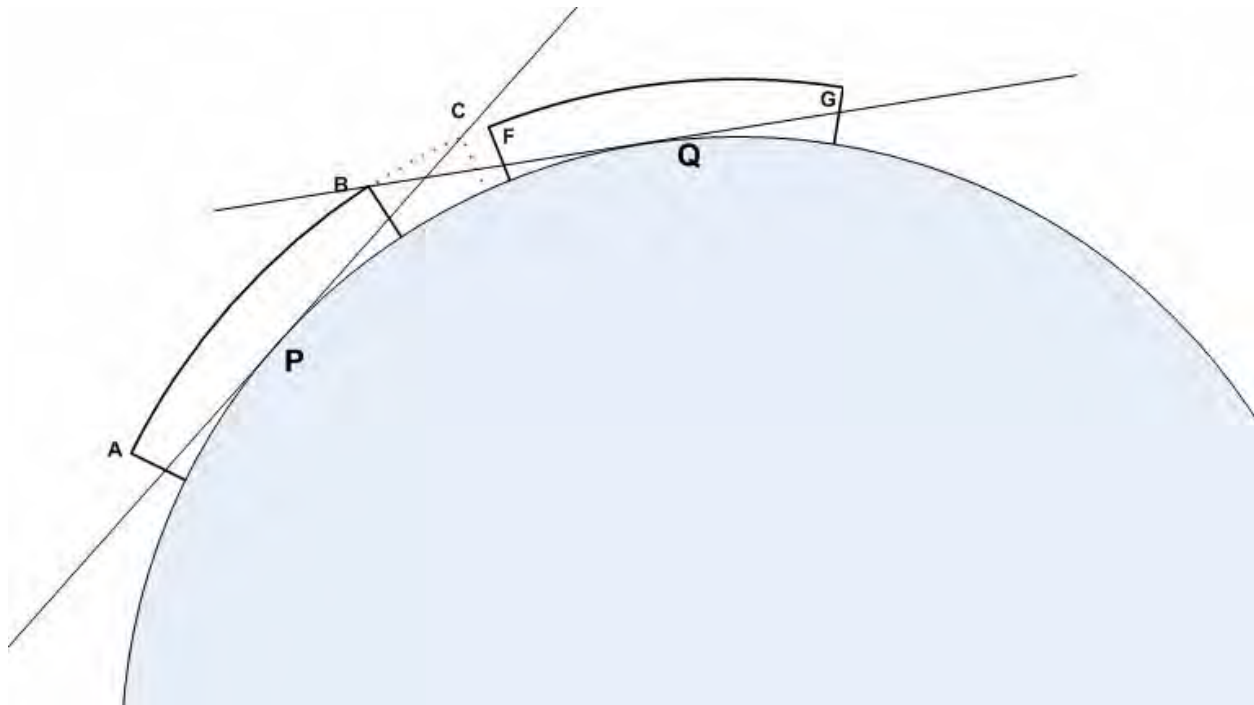


Figure 8

6.1.2 Similarly, for an aircraft travelling from G to F (see Figure 8) and further into the DOC of ground station P, the minimum separation distance needs to be equal to the sum of the distance to the radio horizon of the aircraft to ground station Q plus the distance of the DOC-range from point B to

ground station P plus a small buffer (buffer not shown in Figure 8). Note that in this case the aircraft may still be locked out by ground station Q when inside the coverage of ground station P but, when it reaches point B where the aircraft enters to DOC of ground station P (and where ground station Q is below the radio horizon), it will no longer receive signals from ground station Q, become unlocked and can respond to All-Calls from ground station P.

6.1.3 In summary, the separation distance between two SSR Mode S ground stations, with the same maximum DOC flight level, is the sum of the DOC-range and the distance to the radio horizon at maximum range/altitude. In case range of the DOC-range of the two ground stations is different, the largest of the two values “DOC-range + radio horizon” needs to be selected.

6.1.4 When plotting this information on a map, the DOC of one station and the radio horizon contour of other (nearby) station may not overlap.

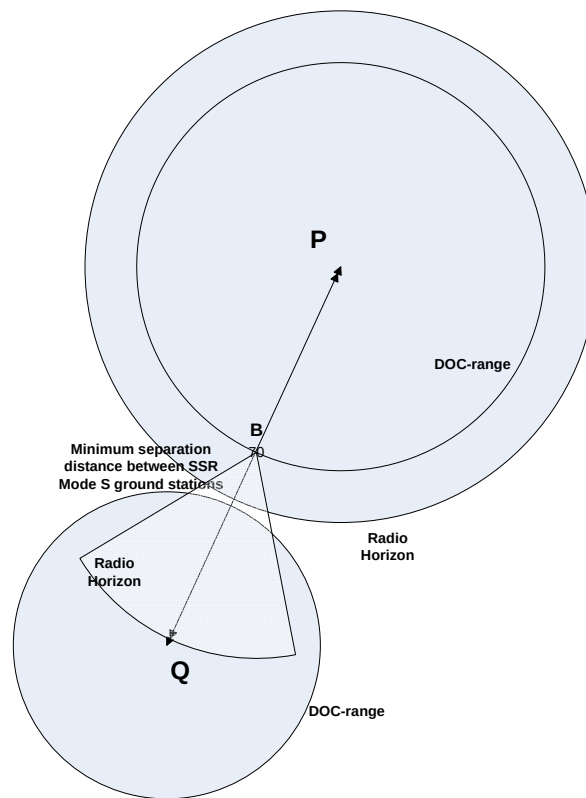


Figure 9

An aircraft entering the DOC of ground station Q needs to be beyond the radio horizon of ground station P; an aircraft entering the DOC of ground station P needs to be beyond the radio horizon of ground station Q.

Note: see paragraph 7.1 for calculation examples

6.1.5 In case the DOC for SSR Mode S ground stations P and Q have a different maximum flight level as in figure 9, the minimum required separation distance between the ground stations can be calculated as follows:

6.2 DOC of two SSR Mode S ground stations has the different maximum flight levels

- a. Aircraft travelling from A to B and further, at maximum altitude for ground station P: No constraints with regard to the location of ground station Q, as the aircraft is operating outside the promulgated maximum flight level of ground station Q.
- b. Aircraft traveling from G' to F' (at the same flight level as the maximum of the DOC for ground station P) and further to B. Aircraft entering at point B the DOC of ground station P are required to no longer receiving signals from ground station Q. This would require ground station Q to be below the radio horizon, seen from point B. The separation distance in this case needs to be the range of DOC of ground station P plus the distance to the radio horizon of point B plus a small buffer (10 NM is proposed)
- c. Aircraft travelling from A' to B' at the same (reduced) flight level as the maximum flight level (DOC) for station Q: Aircraft entering the DOC for ground station F are required to no longer receiving signals from ground station P. The minimum separation distance is the sum of the distance to the radio horizon at point F to ground station P (at the (reduced) flight level for ground station Q) plus the DOC-range for ground station Q plus a small buffer
- d. Aircraft travelling from G to F at the maximum flight level (DOC) for station Q: Minimum separation distance is the sum of the distance to the radio horizon at point B' to ground station Q at the reduced flight level plus the DOC-range for ground station P plus a small buffer.

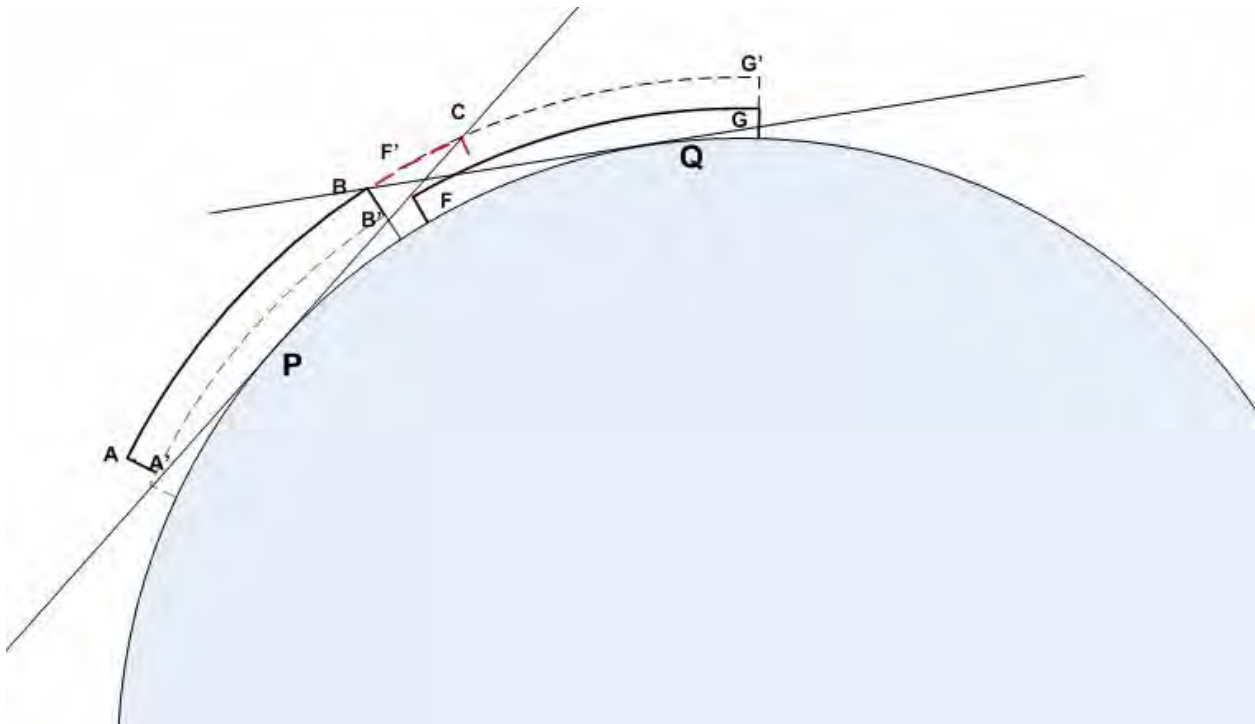


Figure 10

Note: see paragraph 7.2 for calculation examples

6.3 No DOC provided

6.3.1 In case no DOC is provided, maximum coverage is assumed to be protected. In this case, the DOC and the distance to the radio horizon are the same. Coverage areas are compatible if they do not overlap (and maintain a small buffer). In this case it is proposed that SSR Mode S II codes need to be protected up to flight level 450 (45000ft).

Note: The same protection is offered to ACC-upper and FIS upper communication frequencies'

6.4 Mode S ground stations have different II codes.

6.4.1 When SSR Mode S ground stations have different II codes, no separation criteria between the Mode S ground stations need to be applied.

7. Calculation examples.

7.1 DOC same maximum flight level (see also Figure 8)

SSR Mode S station P: DOC 200NM/45000ft

SSR Mode S station Q: DOC 100NM/45000ft

(i) Separation distance between SSR Mode S stations for aircraft travelling from P to Q at FL 450:

Radio horizon [P] + DOC-range [Q] + buffer = 261 + 200 + 10 NM = 471 NM (Re. Paragraph 6.1.1)
(Radio horizon [P] is the radio horizon at the maximum DOC-altitude) of ground station P)

(ii) Separation distance for SSR Mode S stations for aircraft travelling from Q to P at FL 450

Radio horizon [Q] + DOC-range [P] + buffer = 261 + 100 + 10 NM = 371 NM (Re. Paragraph 6.1.2)
(Radio horizon [Q] is the radio horizon at the maximum DOC-altitude of ground station Q)

Note: Radio horizon [P] is equal to radio horizon [Q]

Minimum separation required: 471 NM

7.2 DOC different maximum flight level (see also Figure 10):

SSR Mode S station P 200 NM/45000 ft

SSR Mode S station Q 60 NM/10000 ft

(i) Separation distance between SSR Mode S stations for aircraft travelling from P to Q at FL 450:

No restrictions (Re. Paragraph 6.2.a)

(ii) Separation distance between SSR Mode S stations for aircraft travelling from Q to P at FL 450:

Radio horizon [Q'] + DOC-range [P] + buffer = 261 + 200 + 10 = 471 NM (Re Paragraph 6.2.b)
(Radio horizon [Q'] is the radio horizon at the maximum DOC-altitude of ground station P)

Note: Radio horizon Q' is equal to radio horizon P

- (iii) Separation distance between SSR Mode S stations for aircraft travelling from P to Q at FL 100

Radio horizon [P'] + DOC-range [Q] + buffer = 123 + 60 + 10 NM = 193 NM (Re. Paragraph 6.2.c)
(Radio horizon [P'] is the radio horizon at the maximum DOC-altitude of ground station Q)

Note: Radio horizon P' is equal to radio horizon Q

- (iv) Separation distance between SSR Mode S stations for aircraft travelling from Q to P at FL 100:

Radio horizon [Q] + DOC-range [P] = 200 + 123 + 10 NM = 333 NM (Re. Paragraph 6.2.d)
(Radio horizon [Q] is the radio horizon at the maximum DOC-altitude of ground station Q)

The largest of the three separation distances needs to be maintained.

- (v) Following the same methodology as in paragraph 6.1, for two SSR Mode S stations with a DOC of 60 NM/10000ft a separation distance of 193 NM is required.

8. The separation distance considerations above do not include for compensation in case the SSR Mode S station is located well above MSL. In case the actual height of the SSR Mode S station is known, the distance to the radio horizon, as shown above, needs to be increased with the distance to the radio horizon, seen from the location of the SSR Mode S ground station.

As an example, a radar station at a height of about 3000 ft (1000 m) would require an additional separation of 67 NM, to be included in the calculation of the separation distances identified in paragraph 7.

It would therefore be necessary to introduce, both in the data relevant to the radar location, to introduce the actual height of the radar station (re. MSL).

9. Effectively, the separation distance required between two SSR Mode S ground stations with the same II code can be summarized as the sum of the range of the ground station plus the distance to the radio horizon at maximum altitude of the designated operational coverage. In case no DOC is specified, a DOC of 260nm/45000ft is assumed.

**EXCHANGE OF OPERATIONAL
METEOROLOGICAL (OPMET) INFORMATION**

(FASID Tables MET 2A, ROBEX Handbook and
Asia/Pacific OPMET data banks interface control
document)

Exchange of METAR, SPECI and TAF

24. The ROBEX Handbook sets out the Regional OPMET Bulletin Exchange (ROBEX) Scheme for the collection and dissemination of METAR, SPECI, air-reports (AIREP) and TAF. These tables contain information regarding the designated ROBEX centres and their respective areas of responsibility.

[APANPIRG/20, Conc. 20/65]

25. The ROBEX Handbook should be updated, as necessary, by the ICAO Asia and Pacific Regional Office (Bangkok) in coordination with the ICAO Middle East Regional Office (Cairo) on the basis of changes in the pattern of aircraft operations, the Statement of Basic Operational Requirements and Planning Criteria and in consultation with those States and international organizations directly concerned.

[APANPIRG/20, Conc. 20/65]

26. Requirements for METAR, SPECI and TAF not carried on the ROBEX Scheme which should be available at meteorological offices are contained in FASID Table MET 2A. This table should be updated, as necessary, by the ICAO Regional Office on the basis of changes in the pattern of aircraft operations, the Statement of Basic Operational Requirements and Planning Criteria,

and in consultation with those States and international organizations directly concerned.

[ASIA/PAC/3, Recs. 9/1 and 9/8]

27. The exchanges indicated in FASID Table MET 2A should be implemented as soon as possible, but only for those related to current aircraft operations. New exchanges should be started coincidentally with the introduction of new aircraft operations. Any changes in this respect (i.e. additional OPMET information needed or OPMET information no longer required) should be notified to the corresponding meteorological authority which, in turn, should inform the ICAO Regional Offices concerned.

[ASIA/PAC/3, Rec. 9/8]

**OPMET data banks
to support the ROBEX Scheme**

28. The OPMET data banks in Bangkok, Brisbane, Nadi, Singapore and Tokyo have been designated to support the ROBEX scheme and serve States in the ASIA/PAC regions to access OPMET information which is required but not received. The Asia/Pacific OPMET data banks interface control document sets out the responsibilities of the ASIA/PAC OPMET data banks for collection and dissemination of OPMET bulletins together with procedures to be used in communicating with the data banks to support the ROBEX Scheme. The Asia/Pacific OPMET data banks interface control document is maintained by the ICAO Asia and Pacific Regional Office (Bangkok) in coordination with the regional OPMET data banks.

[APANPIRG/20, Conc. 20/66]

**3. EXCHANGE OF OPERATIONAL
METEOROLOGICAL INFORMATION**
(FASID Tables MET 2A, ROBEX Handbook
and Asia/Pacific OPMET data banks interface
control document)

3.1 The requirements for the exchange of METAR, SPECI and TAF, not catered for by the ROBEX Scheme, to meet the requirement of international flight operations in the ASIA/PAC Region are shown in FASID Table MET 2A.

3.2 The ROBEX Handbook sets out the Regional OPMET Bulletin Exchange (ROBEX) Scheme for the exchange of METAR, SPECI, air-reports (AIREP) and TAF. The ROBEX Handbook should be updated, as necessary, by the ICAO Asia and Pacific Office (Bangkok) in coordination with the ICAO Middle East Office (Cairo).

3.3 The Asia/Pacific OPMET data banks interface control document reflects the requirements for the operation of the ASIA/PAC OPMET data banks to support the ROBEX Scheme. The Asia/Pacific OPMET data banks interface control document is maintained by the ICAO Asia and Pacific Office (Bangkok) in coordination with the regional OPMET data banks. The responsibilities of the ROBEX OPMET data banks are as follows:

- a) support the ROBEX Scheme to facilitate a regular exchange of OPMET information within the ASIA/PAC Regions;
- b) operate as Inter-regional OPMET Gateways (IROG) with responsibility of exchanging the OPMET information between ASIA/PAC Regions and other Regions; and
- c) provide request/response facilities for users to obtain non regular or occasional information.

CNS/ATM Implementation Planning Matrix

State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
AUSTRALIA	ATN tests were conducted. BIS Router and Backbone BIS Router and AMHS implemented.	AFTN based AIDC Implemented between Brisbane and Melbourne, Auckland, Nadi and Auckland. AIDC is also in use between Melbourne and Mauritius.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented	Implemented		16 ADS-B sites are operational. A total of 28 UAP ground stations are expected to become operational throughout 2007. Additional 20 stations have been delivered in 2007 for installation at en-route radar site and other sites. 5NM Separation service has been introduced. NFRM on the carriage and use of ADS-B avionics has been issued. WAM installed in Tasmania. Commissioning expected 2009. Provides radar like WAM data and ADS-B data.	FANS 1/A ADS-C implemented.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
AUSTRALIA (Cont'd)							ASMGCS with multilateration being installed at Melbourne, Sydney, Brisbane and Perth. Operational between 2009 -2010 Multilateration based precision runway monitor to be commissioned in 2010.		
BANGLADESH	BIS Router and AMHS planned for 2011.	AIDC between Dhaka and CTG, Dhaka and Sylhet planned for 2011.		Not yet planned	Not yet planned		Not yet planned	Not yet planned	
BHUTAN	ATN BIS Router and UA service 2011.					Procedures developed for NPA.			
BRUNEI DARUSSALAM	ATN BIS Router planned for 2009 and AMHS planned for 2009-2011.								

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
CAMBODIA	BIS Router and AMHS planned for 2011.	Planned 2009	Planned 2009			Procedure developed for NPA.			
CHINA	ATN Router and AMHS deployed in 2008. Tripartite BBIS trial completed with Bangkok and Hong Kong, China in Jan. 2003. ATN trial with Hong Kong using XOT over internet conducted in 2006, Further trials planned in 2009. AMHS/ATN tests with Macau is on going.	AIDC between some of ACCs within China has been implemented. AIDC between several other ACCs are being implemented. AIDC between Sanya and Hong Kong put in to operational use in Feb 2007. AIDC between Qingdao and Incheon planned for 2013.	Implemented to ATS Rout. L888 route, Trial on HF data link conducted for use in western China.	Implemented in certain airspace. L888, Y1 and Y2 routes.	RNAV (GNSS) implemented in certain airports. Beijing, Guangzhou, Tianjin.	Ali, Linzhi and Lhasa airports	ADS-B trial has been conducted in 2006. 5 UAT ADS-B sites are operational and used for flight training of CAFUC. Another ADS-B project for ATS route between Chengdu and Jiuzhai using 1090ES conducted since 2008. Will be followed by Chengdu – Lhasa and B215 route.	FANS 1/A based ADS-C implemented. L888 route.	
HONG KONG, CHINA	ATN and AMHS technical trial with Japan conducted in 2003.	AFTN-based AIDC with Sanya put into operational use in February 2007.	FANS 1/A based CPDLC trials completed in 2002.	Implemented in certain airspace	Implemented in certain airspace.	RNAV (GNSS) departure procedures implemented in July 2005.	A-SMGCS trial using ADS-B/ Multilateration technology on the prime airport surveillance area completed in 2006.	FANS 1/A trials for ADS-C completed in 2002.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
HONG KONG, CHINA (Cont'd)	64 Kbps ATN Link with Bangkok put into operational use in June 2004. Preliminary ATN/AMHS technical trials with China (Beijing) using VPN over Internet connection conducted in September 2006. Operational AMHS commissioned in June 2009. ATN/AMHS interoperability test with Macao commenced in July 2009. ATN/AMHS interoperability tests with other adjacent communications centres will commence in late 2009. ATN/AMHS operations planned for 2010.	AIDC trial with other adjacent ATS authorities planned for end 2009/2010.	VDL Mode-2 technical trial conducted in 2002. D-ATIS, D-VOLMET and 1-way PDC implemented in 2001. PDC service upgraded to 2-way data link in June 2008.			Flight check for RNAV Procedures conducted in April 2008. 6- months operational trial commenced in February 2009.	A larger-scale A-SMGCS covering the whole Hong Kong International Airport put into operational use in April 2009. Data collection/analysis on aircraft ADS-B equipage in Hong Kong airspace conducted on quarterly basis since 2004. ADS-B trial using a dedicated ADS-B system was conducted in April 2007. Further ADS-B trial planned for 2010.		

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
MACAO, CHINA	ATN AMHS interoperability with China started 25 March with planned duration of 2 months. ATN & AMHS tests with Hong Kong commenced on July 2009.								ATZ within Hong Kong and Guangzhou FIRs. In ATZ full VHF coverage exist. Radar coverage for monitoring purposes.
COOK ISLANDS									
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	The ATN BIS Router and AMHS to be implemented in 2011.	With neighboring ACCs to be implemented TBD		Implemented in certain ATS routes G711, B467		RNAV(GNSS) Non-precision approach to be implemented in 2011.	ADS-B has been used as back-up surveillance of SSR since 2008.		
FIJI	ATN BIS Router and AMHS implementation by 4 th quarter 2010.	AFTN based AIDC implemented between Nadi, Brisbane, Auckland and Oakland.	Implemented and integrated with ATM systems to support FANS1/A equipped aircraft.	Implemented		Implemented	ADS-B implementation in 2009/2010.	FANS 1/A ADS-C implemented.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
FRANCE <i>(French Polynesia Tahiti)</i>		Implementation of limited message sets with adjacent centres under discussion.	FANS-1. Implemented since 1996.					FANS 1/A ADS-C implemented since March 1999.	
INDIA	ATN BBIS router and AMHS Physical installation over. SAT in May 2008, coordinating with China, Thailand and Singapore for conduct of test.	AFTN Based AIDC Coordinating with Bangladesh and Pakistan and, we are ready.	FANS-1 implemented at Kolkata, Chennai, Mumbai and Delhi.	SBAS Technical development in 2007. Implementation planned for 2009.			Trial planned for 2006. ASMGCS Implemented at IGI Airport New Delhi.	FANS 1/A ADS-C implemented at Kolkata, Chennai, Delhi and Mumbai.	
INDONESIA	ATN BIS Router and AMHS planned for trial in 2009. Trial with Singapore planned.	Brisbane and Makassar in planned in June 2009.	FANS-1/A. CPDLC in Ujung Pandang FIRs already trial start from 2008 and will be implemented in 2009.			Procedure to be completed in 2006 for NPA.	22 ADS-B ground stations have been installed in 2009. Upgrading ATC automation at Makasar for ADS-B application capabilities in 2009.	FANS 1/A ADS-C trial planned at Jakarta and Ujung Pandang ACC in 2007.	MATSC new version with capability for ADS-B and Mode-S will be operated in 2009.

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
JAPAN	ATN BBIS already implemented. AMHS implemented between Japan and USA in 2005 and between Japan and Hong Kong, China, ROK, Singapore, Australia planned for 2009-2011. Connection test between Taipei 2008 – ongoing.	AIDC based. AFTN procedure implemented with Oakland and Anchorage. Planned between Incheon ACC and Fukuoka ATMC 2009. Between Fukuoka, ATMC and Taipei ACC 2012.	FANS1/A system Implemented in Fukuoka FIR.	SBAS implemented RNAV5 implemented.	RNAV1 implemented	RNP Approach implemented	Two (2) Multilateration will be implemented in January 2010.	FANS 1/A. ADS-C implemented in Fukuoka FIR.	
KIRIBATI									
LAO PDR	ATN BIS Router and AMHS completed planned for implementation with Bangkok in 2010.	AIDC with Bangkok planned for 2010.		Implemented. Planned for 2011.					
MALAYSIA	ATN BIS Router completed 2007. AMHS planned in 2011	AFTN AIDC planned with Bangkok ACC in 2011.	Implemented for Bay of Bengal in July 2008.	Implemented for Oceanic Routes.	Basic RNAV implemented	NPA at KLIA implemented	Implementation of ADS-B proposed in 2010 - 2015.	FANS 1/A ADS-C implemented for Bay of Bengal on July 2008	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
MALDIVES	ATN BIS Router/AMHS planned for implementation in the 2011.	Planned for 2011.	FANS1/A installed Trials planned in last quarter of 2007.	Trials planed for 2005-2008. Implementation in later 2008.			Trials planned for 2007-2008. Implementation in late 2008.		
MARSHALL ISLANDS						NPA implemented at Majuro Atoll.			
MICRONESIA (FEDERATED STATES OF)									
Chuuk				Implemented					
Kosrae				Implemented					
Pohnpei				Implemented					
Yap				Implemented					
MONGOLIA	ATN BIS Router and AMHS planned for 2005 and 2006. Trial with Bangkok conducted.		Function available. Regular trials are conducted.		GPS procedures are being developed and implemented at 10 airports.		ADS-B trial in progress implementation planned for 2006.	FANS 1/A ADS-C implemented since August 1998.	
MYANMAR	Implementation of AMHS to be completed by the end of 2010.	The capability of ATM Automation system to support AIDC by 2011	Implemented since August 1998.				A plan to implement ADS-B by 2011	Implemented since August 1998.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
NAURU									
NEPAL	BIS Router and AMHS planned for 2010.	AFTN/AMHS based AIDC between KTM-CAL, KTM-BAN, KTM-LHASA planned for 2010.			GPS departure and approach has been developed for 8 airports and planned for implementation in 2008.		ADS-B feasibility study planned for 2007.		
NEW CALEDONIA							Tontouta ACC 2009 Tontouta APP 2009.		
NEW ZEALAND	BIS Router and AMHS implementation planned for 2010.	AFTN based AIDC implemented between New Zealand, Australia, Fiji, Tahiti, Chile and USA.	FANS-1/A. Implemented	Will be implemented as required.	RNAV procedures being implemented as developed.	RNP AR APCH implemented at Queenstown (ZQN).	Domestic trial was conducted in 2005. Use will be re-evaluated in 2008. Trial of Area MLAT conducted in 2006. ADS-B planned as an element of MLAT at specific sites for domestic use.*	FANS 1/A Implemented	*MLAT being implemented in Auckland (Surface Movement) and Queenstown.

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
PAKISTAN	Implementation of ATN considered for Phase II (2005-2010).	Implemented between Karachi and Lahore ACCs	Implementation planned from 2005-2010.	Planned for 2005-2010.	RNAV arrival and departure procedure being developed.	NPA procedure are being developed.	Feasibility study for using ADS-B is in hand. One station was installed at ACC Karachi and evaluation is in progress.	Planned for 2005-2010.	Existing Radar system being upgraded.
PAPUA NEW GUINEA				Implemented		Implemented at certain aerodromes.			
PHILIPPINES	ATN G/G BIS Router/AMHS implemented in 2006. AMHS trials with Singapore by end 2008 and Hong Kong planned in 2009.	Planned for 2011.	CPDLC Planned for 2011.				Included in CNS/ATM Project and scheduled for implementation in 2011.	FANS 1/A ADS-C planned for 2011.	

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
REPUBLIC OF KOREA	ATN BIS Router/AMHS planned for 2011.	AFTN based AIDC planned for 2009 between Incheon ACC and Fukuoka ATMC. AIDC between Incheon and Qingdao planned for 2013.	PDC & D-ATIS implemented 2003.			NPA procedure developed at Incheon International Airport in 2008.	ADS-B trials planned for 2008-2009 at Incheon International Airport.	FANS 1/A based ADS-C implemented since 2003 for contingency purpose.	
SINGAPORE	AMHS implemented. ATN BIS Router trial with Malaysia commenced in 2007 and with Indonesia in 2009. ATN/AMHS trial planned with Australia, India, Thailand, UK and Philippines.	ATN based AIDC to be implemented	Implemented since 1997. Integrated in the ATC system in 1999.		RNAV SIDS and STARS implemented in 2006.	NPA Procedure implemented in 2005.		FANS 1/A ADS-C implemented since 1997. Integrated with ATC system in 1999.	
SRI LANKA	ATN BIS Router Planned for 2009. AMHS planned along with BIS in 2009.		PDLC in trial operation since November 2000.				ADS-B Trials planned for 2010 and implementation in 2011.	FANS 1 /A ADS-C trial since November 2000.	GPS based domestic route structure being developed.

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
THAILAND	BBIS/BIS Routers already implemented. Target date for AMHS in 2008.	AFTN based AIDC planned for 2010.	FANS-1/A Implemented.	Under implementation	Implemented at Phuket Airport	Implemented at Phuket	Multilateration implemented in 2006 at Suvarnbhumi Int'l. Airport. 22 ADS-B ground stations will be implemented in 2008.	FANS 1/A ADS-C Implemented.	
TONGA	AMHS planned for 2008.					NPA planned for 2007.	Trial planned for 2010		CPDLC and ADS-C is not considered for lower airspace
UNITED STATES	AMHS implemented. AMHS Atlanta Sept 2009 to serve CAR/SAM,/ North Atlantic/Europe	AFTN based AIDC implemented.	FANS-1/A based CPDLC implemented.	Implemented	Implemented		Implemented	Implemented	
VANUATU									

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State/Organization	ATN G/G Boundary Intermediate System (BIS) Router/AMHS	AIDC	CPDLC	Navigation*			ADS-B/ Multilateration	ADS-C	Remarks
				En-route	Terminal	Approach			
VIET NAM	BIS Routers planned for 2009. ATN/AMHS trial in 2010 and operation in 2012.	AFTN based AIDC implemented in 2009. Trial for ATN based AIDC planned in 2010.	CPDLC operational trial conducted in early 2007.	For en-route TBD.	RNAV		TBD.	FANS 1/A ADS-C operational trial conducted for oceanic area of Ho Chi Minh FIR since March 2002.	

* Navigation – Navigation including Performance Based Navigation (PBN), APV and precision approach

TERMS OF REFERENCE OF CNS/MET SUB-GROUP

- 1) Ensure the continuing and coherent development of the ASIA/PAC Regional Air Navigation Plan in the CNS/MET fields in accordance with the Global Air Navigation Plan.
- 2) Review and identify deficiencies that impede the implementation or provision of efficient CNS/MET services in the ASIA/PAC Region.
- 3) Monitor CNS/MET systems research and development, trial and demonstrations in the fields of CNS/MET and facilitate the transfer of this information and expertise between States.
- 4) Make specific recommendations and guidance materials aimed at improving CNS/MET services by the use of existing procedures and facilities and/or through the evolutionary implementation of CNS/ATM systems.
- 5) Review and Identify Inter-regional and intra-regional co-ordination issues in the fields of CNS/MET and recommend actions to address those issues.

SUBJECT/TASKS LIST IN THE CNS/MET FIELDS

The priorities assigned in the list have the following connotation:

A = Tasks of a high priority on which work should be expedited;

B = Tasks of medium priority on which work should be under taken as soon as possible but not to the detriment of Priority "A" tasks; and

C = Tasks of medium priority on which work should be undertaken as time and resources permit but not to the detriment of priority "A" and "B" tasks.

TOR = Terms of Reference of the Sub-Group

TASKS NO. 1 TO 31 HAVE BEEN COMPLETED AND REMOVED FROM THE LIST

No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
1 (32)	RAN/3 C.8/14 APANPIRG/14 (TOR 3)	A-Safety E-Continuity GPI-19	Subject: Inadequate implementation of procedures for advising aircraft on volcanic ash and tropical cyclones Task: Monitoring of the implementation of international airways volcano watch (IAVW) and tropical cyclone advisories and SIGMETs	A	Monitor and provide assistance in the implementation of volcanic ash and tropical cyclone advisories and SIGMETs procedures to ensure provision of timely information on volcanic ash and tropical cyclones to aircraft.	CNS/MET SG Task Force on the implementation of Volcanic Ash and Tropical Cyclone advisories and SIGMETs (VA/TC/I TF)	On going
2 (35)	(TOR 3)	D – Efficiency All GPIs	Subject: To facilitate regional implementation of CNS/ATM Tasks: a) coordinate training/workshops to allow States to develop and implement new CNS/ATM procedures; b) encourage States to participate in the evaluation and training of new CNS/ATM systems;	A	1) Identify topics for training, develop syllabi and plan training programme; 2) Encourage States in the evaluation and training of new CNS/ATM systems; 3) Co-ordinate with States and monitor progress;	CNS/MET SG	On-going On-going On-going

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
			c) progress the adoption of WGS-84 co-ordinate system and introduction of high integrity systems for the management of the co-ordinate data.		4) Collect information and suggest methods of resolving problems commonly faced by the States.	ATM/AIS/SAR CNS/MET SG	On-going
3 (36)	APANPIRG D. 4/46 RAN/3 C.12/3 APANPIRG 5/3 (TOR 3)	D – Efficiency All GPIs	Subject: Provision of adequate CNS/MET services Task: Monitor CNS/ATM systems research and development, trials and demonstrations in the fields of CNS/MET and facilitate the transfer of this information and expertise between States.	A	1) Encourage States to conduct R&D, trials & demonstrations of new CNS/MET services; 2) Monitor global developments that may have beneficial consequences on regional planning activities; 3) Consolidate information on new capabilities in the CNS/ATM system, for the Sub-Groups review and action; 4) Serve as a focal point for review of ongoing work of Regional formal and informal working groups that is relevant to CNS/MET; 5) Provide for coordinated training/seminars to keep all States informed on developments of trials and demonstrations.	CNS-MET	On-going
4 (37)	C 12/24	D – Efficiency GPI-19	Subject : Transition to the GRIB and BUFR coded WAFS products	A	1) Monitoring of implementation of BUFR coded SIGWX forecasts	CNS/MET SG	Completed

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
			Task : Implementation of the transition to the GRIB and BUFR coded WAFS products		2) Monitoring of the migration to SADIS 2G 3) Assist in preparation for the new gridded products for turbulence, icing and cumulonimbus 4) Monitoring of the migration to ISCS G3	WAFS Implementation Task Force WAFS/I TF WAFS/I TF	Completed 2013 2009-2012
5 (38)	C12/36 APANPIRG C14/45	D – Efficiency GPI-19	Subject: Developing the new requirements for MET products and services in support of ATM.	A	1) Development of the initial draft of the MET Chapter; 2) Development of the MET components of the CNS/ATM concept/ strategy; 3) Inclusion of ATM requirements for MET information in the CNS/ ATM Plan; 4) MET/ATM Coordination Seminar – February 2006. 5) Conduct survey on ATM requirements for MET information 6) MET/ATM meeting in 2009 7) MET/ATM seminar in 2010	CNS/MET SG with assistance of MET WG on CNS/ATM Plan CNS/MET SG METATM TF METATM TF MET ATM TF MET ATM TF	Completed Completed Completed Completed Reconvene 2009 2010

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
6 (39)	APANPIRG/13 D 13/28	A - Safety D – Efficiency GPI-19	Subject: To improve the efficiency of the regional and inter-regional OPMET exchange and the availability of OPMET information from the ASIA/PAC Region Task: Review and optimize the ROBEX scheme and other OPMET exchanges; introduce monitoring and management procedures for the ROBEX centres and Regional OPMET data banks	A	1) Review and update regional ROBEX tables and relevant documents; 2) Propose optimization changes to the ROBEX scheme; 3) Improve the availability of OPMET data at the Regional OPMET Data Banks (RODB); 4) Improve the availability of OPMET information from the Pacific States; 5) Introduce monitoring and management Procedures.	CNS/MET SG OPMET Management Task Force (OPMET/M TF)	Recurrent task Completed On-going On-going Completed
7 (43)		D- Efficiency GPI17,18,19,22	Subject: Implementation of data link Task: Encourage implementation	A	Encourage States to implement CPDLC, D-ATIS, D-VOLMET, PDC and DPC	CNS/MET SG	Continuous SIP Seminar on DFIS was conducted. in 2008 -
8 (45)	APANPIRG List of deficiencies	A – Safety GPI - 19	Subject: Implementation of SIGMET Task: Improve regional procedures and availability of SIGMET from ASIA/PAC States	A	1) Assist States in implementing SIGMET requirements; 2) Conduct regular SIGMET tests; 3) Review and update training and guidance material; 4) Regular monitoring on the availability and quality of	CNS/MET SG VA/TC/I TF	Recurrent task Recurrent task Recurrent task Recurrent task

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
					SIGMET and advisories.		
9 (46)	APANPIRG/17 C 17/23	D-Efficiency GPI-5 GPI-11	Subject: To implement Performance Based Navigation Concept in Asia/Pacific Region Task: Implement Performance Based Navigation in the Region.	A	1) To conduct Workshops/Seminars in the Region to familiarize the States about PBN Concept 2) To develop roadmap for implementation of RNP and RNAV procedures	CNS/MET SG ATM/AIS/SAR SG CNS/MET SG	Seminar and Workshop on PBN were Conducted in 07/08 and in 03/2009 Regional PBN plan to be adopted in 2009.
10 (48)		D-Efficiency GPI22 GPI9	Subject: FASID Task: Updating of FASID Table CNS-1B, CNS-1C, CNS-1E, CNS-4A and CNS 4B.	A	Seek State revision of Tables prior to March 2010. Review and update FASID Tables with the assistance of the Secretariat	CNS/MET SG	The plan need to be further updated. Amendment proposal process by Mar.2010
11 (49)		A-Safety D-Efficiency E-Continuity GPI23	Subject: WRC-2011 (2012) Task: Supporting ICAO position for ITU WRC-2011 on agenda items related to civil aviation	A	Seek States to support ICAO position at regional telecommunity – APT APG and at WRC.	CNS/MET SG	2012 RPG to be held in December 09
12 (50)	TBD by APANPIRG/20	D-Efficiency E-Continuity GPI21 GPI11	Subject: SBAS capability study Task: conduct study on the need for and feasibility of establishing a regional SBAS capability	B	To conduct study by members of the CNS/MET Sub-group	CNS/MET SG	2011

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No.	Ref.	Associated Strategic Objective & GPIs	Task	Priority	Action Proposed/In Progress	Action by	Target Date
13 (51)	TBD by APANPIRG/20	A-Safety D-Efficiency GPI9	Subject: Study of using SSR Mode S SI code Task: , Study on the need for introduction of SSR Mode S SI code for future use in the Asia and Pacific region	B	To conduct study by members by the CNS/MET Sub-group	CNS/MET SG	2012

*** Number in bracket indicates sequential number since establishment of the Sub-group.**

Agenda Item 3.5: ATS Coordination Group Activities

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.5 ATS Coordination Group Activities

3.5.1 The meeting was updated on the activities of the ICAO and State ATS coordination groups that contribute to the work of APANPIRG.

3.5.2 The Secretariat thanked the informal ‘non-ICAO’ groups which were run solely by States for their excellent work in progressing ATM implementations across the region and, equally importantly, for providing reporting via the Regional Office that enabled APANPIRG to better understand the work programmes being pursued by the informal groups and thereby avoid duplications of effort and associated ineffective use of resources.

1. ICAO ATS Coordination/Implementation Groups

- **Bay of Bengal ATS Coordination Group (BBACG)**

BBACG/20 (Male, 26 - 30 January 2009, with ASIOCG/4)

Air Traffic Flow Management Task Force (ATFM/TF)

- o ATFM/TF/12 (Cairo, 13 – 17 July 2008, with IRAI).
- o Next meeting ATFM/TF/13, Bangkok, 22-25 September 2009

FANS Implementation Team, Bay of Bengal (FIT-BOB)

- o FIT-BOB/10 (Mumbai, 7 – 11 July 2008, with ASIOACG/3)
- o FIT-BOB/11 (Bangkok, 24 and 25 August 2009, with Data Link Seminar)

Bay of Bengal Reduced Horizontal Separation Task Force (BOB-RHS/TF)

- o First meeting BOB-RHS/TF/1, Bangkok, 2-6 November 2009

- **Southeast Asia ATS Coordination Group (SEACG)**

SEACG/16 (Bangkok, 11-15 May 2009, with FIT-SEA/9)

Southeast Asia RNP Implementation Task Force (RNP-SEA/TF)

- o RNP-SEA/TF/4 (Singapore, 5 – 7 November 2008)

FANS Implementation Team, South -East Asia (FIT-SEA)

- o FIT-SEA/9 (Bangkok, 11 - 15 May 2009, with SEACG/16)

- **Western Pacific/South China Sea RVSM Scrutiny Working Group (WPAC/SCS RSG)**

WPAC/SCS RSG/5 (Bangkok 14 - 17 October 2008)

WPAC/SCS RSG/6 (Bangkok 7 - 9 April 2009)

- **Southeast Asia Route Review Task Force (SEA RR/TF)**
 - First meeting SEA RR/TF/1, Bangkok, 8-11 December 2009
- 2. ICAO Special Coordination Meetings (SCM)
- **Special Coordinating Meeting with the Civil Aviation Authority of Singapore for RNP-SEA/TF** (Bangkok, 17 February 2009)
- 3. ICAO Interregional Coordination Meetings
- **Inter Regional Afghanistan Interface (IRAI) meeting** [did not meet since the last IRAI meeting in Cairo, 13-17 July 2008, with ATFM/TF/12]
- **Third Inter Regional Meeting between APAC, ESAF, EUR/NAT and MID Regional Offices**
IRCM/3 (Cairo 24-26 March 2009)
- **China, Mongolia, Russian Federation, IATA ATS Coordination Group (CMRI)** [did not meet since the last meeting CMRI/5 in Bangkok, 20 -22 June 2007]
- **Trans-Regional Airspace and Supporting ATM Systems Steering Group (TRASAS)** [TRASAS/3 postponed; last meeting TRASAS/2 in Bangkok, 18 – 19 March 2008]
- 4. State ATS Coordination Groups
- **Informal South Pacific ATS Coordinating Group (ISPACG)**
(<http://www.airways.co.nz/ispacg/index.asp>)
ISPACG/23 (Chile, 19 – 23 March 2009, with FIT/16)
FANS Interoperability Team (FIT)
 - FIT/16 (with ISPACG/23)
- **Informal Pacific ATC Coordinating Group (IPACG)**
(http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/oceanic/ipacg/)
IPACG/29 (Fukuoka, 27 – 31 October 2008, with FIT/16)
IPACG/30 (Seattle, 18 – 22 May 2009, with FIT/17))
FANS Interoperability Team (FIT)

- o FIT/16 (Fukuoka, 28 October 2008, with IPACG/29)
- o FIT/17 (Seattle, 19 May 2009, with IPACG/30)
- **Cross Polar Working Group (CPWG)**
CPWG/7 (Paris, 3-5 June 2009)
- **Asia/Pacific Regional Air Navigation Service Providers Conference (ANSP Conf)**
ANSP/4 (Singapore, 26-28 April 2009)
- **Arabian Sea/Indian Ocean ATS Coordination Group (ASIOACG)**
ASIOACG/3 (Mumbai, 7 – 11 July 2008, with FIT-BOB/10)
ASIOACG/4 (Male, 26-30 January 2009, with BBACG/20)
(<http://ekgroup.com/raws> , raws, r@Ws123)
 - o First ASIOACG CNS-ATM Working Group, Dubai, 7-8 October 2009

Twentieth Meeting of the Bay of Bengal ATS Coordination Meeting (BBACG/20)

3.5.3 The meeting noted the following main points of interest arising from BBACG/20:

- a) BBACG established BOB-RHS/TF with the scope of work to implement 50 NM longitudinal separation using CPDLC in the Bay of Bengal;
- b) BBACG recognized the necessity for a formal monitoring programme, on a sub-regional basis for lateral and longitudinal navigation errors in the Bay of Bengal;
- c) An ANP amendment proposal to designate a number of conventional oceanic routes as RNAV routes over a widespread area of the Indian Ocean was prepared, for implementation on November 2009 AIRAC. Noting that, in some cases, these route changes will also have an impact on the MID and AFI ANPs, the Regional Office has conducted significant coordination with the Cairo and Nairobi Regional Offices of ICAO to ensure that complementary amendments to the respective ANPs are progressed.

Eleventh Meeting of FANS Implementation Team, Bay of Bengal (FIT-BOB/11) and Data Link Seminar

3.5.4 In addition to details of relevant ICAO provisions and regional data link guidance materials, the seminar which preceded FIT-BOB/11 was expected to provide practical information from experienced data link operators and pilots, air navigation services providers, network system providers and airframe manufactures, and the technical background to the work undertaken by a data link Central Reporting Agency (CRA). In this context, seminar presentations were structured around the following broad topics:

- 1) What is ADS-C, what is CPDLC, what is data link;
- 2) ADS/CPDLC operating procedures & documentation – FANS Operations Manual (FOM), ICAO provisions in relation to data link services & ICAO document references for ADS/CPDLC;
- 3) Requirements for ATC Systems with ADS/CPDLC;
- 4) Pilot Perspectives of ADS/CPDLC, including cockpit practices and procedures;
- 5) Data network system provision and architecture;
- 6) Roles and functions of FIT, including Problem Reports (PR) and system performance analysis;
- 7) Data link CRA – role, functions, outputs; and
- 8) Safety assessment and monitoring – the role of EMA.

3.5.5 The FIT-BOB/11 meeting expressed its strong support for the GOLD, noting the beneficial developments to existing material from the *FANS Operations Manual* (FOM), and additional guidance and informational material on both old and new subjects that had been included in the GOLD. The FIT-BOB/11 meeting encouraged all delegates to undertake a review of the GOLD ver. 0.5 and provide feedback before the September 30 deadline to tom.kraft@faa.gov.

Sixteenth Meeting of the Southeast Asia ATS Coordination Group (SEACG/16)

3.5.6 The meeting noted the following main points of interest arising from SEACG/16:

- a) Hong Kong, China remarked that the traffic flow regulation on M771 for flights bound for Guangzhou and/or Shenzhen reported by Singapore was placed by Hong Kong ACC mainly due to the limited number of transfer of control points/flight levels that are available for those flights between Hong Kong and China as well as the high traffic density in the Hong Kong terminal control area (TMA).
- b) Thailand also updated the SEACG/16 meeting, in many occurrences in the past, flow control restrictions were imposed by Taipei ACC, due to system maintenance between 1525 – 1840 UTC (2225 – 0140 Thailand time);
- c) Arrangements for Large Scale Weather Deviation (LSWD) procedures were agreed; activation NOTAMS should be sent in accordance with the current protocols between NOF.
- d) IATA requested realignment of L642 and M771. However realignment of L642 and M771 would be likely to affect operations of adjacent ATS routes A1 and P901, and require safety assessment. A more holistic plan acceptable to all concerned parties would need to be worked out; and
- e) The Secretariat drew to the attention of the meeting that the contingency plans required in Annex 11 – *Air Traffic Services* shall be developed by the

State(s) responsible for providing ATS in particular portion of airspace, in the event of disruption of the services, to ensure the safe operations of international air traffic over the high seas.

**Fourth Meeting of Southeast Asia RNP Implementation Task Force
(RNP-SEA/TF/4)**

3.5.7 The meeting noted the main points of interest arising from RNP-SEA/TF/4:

- a) After the implementation of the 50 NM longitudinal separation, the maximum movement rate on M771 stood at 15 movements per hour, a 7% increase, whereas on L642 the maximum movement rate had gone up from 11 to 13 movements per hour, an 18% increase;
- b) Data collected showed that average delay from Changi Airport per flight had reduced from 1.28 minutes down to 1.09 minutes, a 15% reduction;
- c) Based on system performance during the first 90 days after the introduction of the 50 NM lateral separation standard between L642 and M771, and the 50 NM longitudinal separation on these routes, it was concluded that the regional lateral and longitudinal TLS were satisfied;
- d) The safety assessment supported the continued use of RNP 10 (50 NM/50 NM) horizontal separation on L642 and M771, and agreed that the application of the 50 NM/50 NM horizontal separation shall continue on L642 and M771;
- e) The RNP-SEA/TF/4 meeting agreed that there was no need to wait for the timeline dates in the Regional PBN Plan to conduct implementations and, where States were agreeable, implementations could take place earlier than the guidelines given in the PBN regional plan; and
- f) RNP 10 operations on the remaining four parallel routes would need the active participation of the Philippines as the four routes transit through the Manila FIR. The RNP-SEA/TF/4 meeting urged Secretariat to encourage the Philippines to participate in future Task Force activities.

**Ninth Meeting of FANS Implementation Team, Southeast Asia
(FIT-SEA/9)**

3.5.8 The following were the main points of interest arising from the FIT-SEA/9 meeting.

- a) The CPDLC performances of downlink in the Ho Chi Minh FIR was 1 minute and 1 second for 95 %, which only marginally met the system performance criteria specified in the FOM (1 minute for 95 %). The system performances in the Singapore FIR for downlink were 93.88 % for 1 minute and 98.88 % for 3 minutes;
- b) There had been no PR for 12 months from either Singapore or Vietnam. From the experience in the North Pacific where hundreds of PRs are reported, the situation of no PR in the South China Sea area could not be explained;

- c) Philippines advised the FIT-SEA/9 meeting that they would initiate the ADS/CPDLC operation trial in the Manila FIR in Q3 or Q4 of 2010, and Japan could consider extending the provision of FIT-SEA CRA services for a couple of years until the ADS/CPDLC operation trial in the Manila FIR in 2010;
- d) The FIT-SEA/6 meeting acknowledged and appreciated the contributions made by CRA-Japan towards the ADS/CPDLC operations which enabled the earlier implementation of the data link services in the Ho Chi Minh FIR; and
- e) Philippines informed that budget approval was obtained for their ACC replacement project, which will replace the current equipment with new one that will have a build-in data link capability. This is a priority project and data link trials are planned for 3rd or 4th quarter 2010. In conjunction with this project, Manila is commencing ADS/CPDLC refresher course and enhanced simulator training courses from the end of May 2009.

Fifth and Sixth Meetings of the Western Pacific/South China Sea RVSM Scrutiny Group (WPAC/SCS RSG/5 & 6)

3.5.9

Following are main points arising from the WPAC/SCS RSG meetings:

- a) The sixth meeting was held to conduct the one year post implementation review of the revised flight level allocation scheme (FLAS) that had been implemented in the Western Pacific and South China Sea (WPAC/SCS) areas on 2 July 2008. Safety performance continued to improve.
- b) WPAC/SCS RSG recognized that the relatively high numbers of LHDs attributable to errors in ATC Unit-to-ATC Unit coordination were still driving the risk estimate and needed to be corrected.
- c) Investigations of LHD should be conducted in the same way as investigations into other ATS incidents, with causal factors identified and remediation put in place.
- d) WPAC/SCS RSG prepared and adopted up-to-date the Large Scale Weather Deviation (LSWD) procedures
- e) As safety performance was reliably meeting the Target Level of Safety, WPAC/SCS RSG agreed that their Terms of Reference were essentially complete and prepared a draft Decision for dissolution, for consideration by APANPIRG.
- f) IATA congratulated WPAC/SCS RSG on the outcomes that had been achieved but were sorry to see such an effective group being dissolved and expressed concern that some of the residual work could fall outside of the areas of responsibility of other groups such as SEACG and a situation could eventuate where a particular work item was not being addressed. WPAC/SCS RSG noted these concerns.

Special Coordination Meeting with the Civil Aviation Authority of Singapore for RNP-SEA/TF

3.5.10 Following are main points of interest arising from the special coordination meeting:

- a) As to the RNP 4 implementation on L642 and M771, Hong Kong, China had informed the Regional Office that they considered the implementation of RNP 4 on these two routes could take place in the Hong Kong FIR around 2013, in line with their internal airspace improvement/enhancement programme;
- b) In terms of the RNP 10 implementation on the other four parallel routes, it is imperative that the data link services be available in the Manila FIR.
- c) In light of the above, RNP-SEA/TF/5 planned in April 2009 was postponed.
- d) Subsequently, ATM/AIS/SAR/SG/19 renamed the RNP-SEA/TF as the South East Asia Route Review Task Force (SEA RR/TF) and redirected the terms of reference.

Third Interregional Coordination Meeting on Interface Issues between APAC, ESAF, EUR/NAT, and MID Regional Offices (IRCM/3)

3.5.11 The IRCM/3 meeting developed a total of 19 interface issue Actions for initiation by the ICAO Regional Offices and/or follow-up by ICAO Headquarters in support to the ICAO Strategic Objectives.

Twenty-ninth and Thirtieth Meeting of the Informal Pacific ATC Coordinating Group (IPACG/29 & 30)

3.5.12 The IPACG/29 meeting celebrated the twentieth year anniversary of IPACG and commemorated the occasion with the signing of the Fukuoka Joint Statement. The IPACG/30 and FIT/17 meetings were hosted by the U.S. Federal Aviation Administration (FAA) in Seattle, Washington from 18-22 May 2009.

Twenty-third Meeting of the Informal South Pacific ATS Coordination Group (ISPACG/23)

3.5.13 Discussions continued the ISPACG's work in the areas of AIDC implementation, DARP expansion, development and adoption of the Global Operational Datalink Manual (GOLD), use of Strategic Lateral Offset Procedures (SLOP), development of shared performance metrics for fuel and emissions, and variations in airspeed in controlled airspace.

Seventh Cross Polar Working Group Meeting (CPWG/7)

3.5.14 Topics of discussion included extension of routes from the Russia airspace into the Anchorage Center airspace, challenges of transitioning to metric altitudes, lateral separation standards (RNP 10), and loss of communications procedures. A draft Concept of Operations and project task list was presented to the CPWG/7 meeting with a target implementation date of 18 November 2010.

Fourth Meetings of the Arabian Sea/Indian Ocean ATS Coordination Group (ASIOACG/4)

3.5.15 The following were the main points of interest arising from the ASIOACG meetings:

- a) Airservices Australia announced that it would extend RNP 4 to the Melbourne FIR to support application of 30/30 NM separations in the oceanic airspace with a target date 12 March 2009;
- b) Legal agreements have been signed between India and IATA, and IATA and Boeing, in regard to funding arrangements for the Bay of Bengal Central Reporting Agency (BOB-CRA);
- c) AAI reported on the evaluation of the trial suspension of the FLAS within the Mumbai FIR since August 2008 and noted that the trials were encouraging;
- d) An analysis was undertaken within the Mumbai FIR from July to December 2008 and only 40% had logged onto the Mumbai ADS/CPDLC;
- e) India, Maldives and Mauritius will convene a meeting in the near future to discuss ICAO deficiencies in the areas of SAR and ATS Letters of Agreement, etc;
- f) Maldives and Sri Lanka have established connector routes between the Colombo and Male FIRs from 18 December 2008;
- g) A connector route from KITAL direct to ELKEL in the Arabian Sea was implemented on 12 March 2009;
- h) The next step to the Flex Tracks was hoped to be a move to User Preferred Routes (UPR) and subsequently dynamic re-route in flight procedures (DARP); and
- i) The ASIOACG/4 meeting agreed that the re-designation of 'conventional' routes to RNAV routes would enable transition to RNP-based separation minima in accordance with the ICAO PBN Concept.

Agenda Item 3.6: Other Air Navigation Matters

Agenda Item 3: Regional Air Navigation Planning and Implementation Issues

3.6 Other Air Navigation Matters

3.6.1 Environment Issues

3.6.2 The meeting was provided with an overview of the work of ICAO's Committee on Aviation Environmental Protection (CAEP) as well as Group on International Aviation and Climate Change (GIACC) related to measures for reducing aviation's contribution to noise, emissions that affect local air quality and greenhouse gas emissions.

3.6.3 The meeting noted that CAEP is preparing a report on the use of Environmental Management Systems (EMS), which is based on the results of a questionnaire sent to States and observers organizations. An ICAO Circular, on the effects that departure thrust variation has on noise and emissions, is under development. The meeting was apprized that guidance contained in *Operational Opportunities to Minimize Fuel Use and Reduce Emissions* (Circular 303) is being updated with new and updated information on current initiatives relating to fuel burn reduction. Since June 2008, the meeting noted that ICAO public website has included a Carbon Emissions Calculator, whose impartial, peer reviewed methodology was developed through CAEP. It applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and cargo carried.

3.6.4 Referring to the *Environmental Technical Manual on the use of Procedures in the Noise Certification of Aircraft* (Doc 9501), the meeting was pleased to note that it has been extensively revised with the purpose of consolidating all incremental changes over the years. The revised document is expected to be approved at CAEP/8 in February 2010 and published soon afterwards. Moreover, under the CAEP process, substantial work has been undertaken to establish medium-term (10 years) and long-term (20 years) environmental goals relating to three types of technologies, viz., noise, NO_x, and fuel burn. With regard to market-based measures, ICAO has developed policies and guidance material and has been collecting information on three market-based measures: a) voluntary measures; b) emission-related charges; and c) emissions trading.

3.6.5 The meeting recalled that the high-level Group on International Aviation and Climate Change (GIACC), formed in January 2008, was tasked to develop and recommend to the Council a Programme of Action on International Aviation and Climate Change. As a result of its fourth and final meeting, GIACC recommended to the consideration of the Council a global aspirational goal of 2% annual improvement in fuel efficiency of the international civil aviation in-service fleet. Besides, GIACC recommended a basket of measures from which States may choose to reduce international aviation emissions such as use of aircraft-related technology, improved air traffic management and infrastructure, more efficient operations, economic/market-based measures, and regulatory measures. The meeting noted that CAEP endorsed the use of the "Commercial Aircraft System Fuel Efficiency Metric (CASFE = Fuel Mass Consumed/Payload × Distance)" as the fuel efficiency metric for the environmental goals assessment.

3.6.6 In addition to technical, operational and market-based measures, the meeting recognized that the use of alternative fuels offers one of the most promising options for reducing aviation emissions. In this regard, the upcoming ICAO Conference on Aviation and Alternative Fuels in Brazil from 16 to 18 November 2009 will consider establishing an internationally agreed roadmap for facilitating the implementation of alternative fuels for aviation. Concluding its discussions, the meeting noted that ICAO is convening a High-level Meeting to review the ICAO Programme of Action on International Aviation and Climate Change from 7 to 9 October 2009 in Montreal and that ICAO will continue to keep the regions informed of future developments on the subject of aviation noise, local air quality and greenhouse gas emissions and continue considering environmental issues

in the planning and implementation of regional air navigation system including the development of new routes, design of terminal procedures and ground movements.

3.6.6.1 The meeting appreciated CAAS for their kind offer to host an ICAO Workshop on Aviation and environmental protection to provide follow up on Action item 45/2 of the 45th DGCA Conference and noted that although preparations were in hand for this event scheduled from 14 to 15 September 2009, the workshop had to be deferred to a future date due to the High Level Meeting on International Aviation and Climate Changes scheduled to take place in Montreal from 7 to 9 October 2009.

3.6.7 Continuing its deliberations on the subject of environment, Japan presented their initiative which, in conjunction with the FAA and other ANSPs in oceanic airspace, has placed renewed emphasis on developing operational improvements designed to increase efficiency and reduce greenhouse gas emissions through several programmes in the Pacific Ocean. The operational improvements include: implementation of RVSM in Fukuoka FIR oceanic airspace; reduced lateral and longitudinal separations; Introduction of User Preferred Route (UPR) in the routes between New Zealand and Japan, New Caledonia and Japan and routes between Hawaii and Japan. In addition to oceanic area, JCAB also has introduced RNAV and Continuous Descent Arrivals (CDA) in order to reduce Greenhouse Gas (GHG) emission. Furthermore, JCAB also has introduced RNAV and Continuous Descent Arrivals (CDA) in order to reduce Greenhouse Gas (GHG) emissions.

Safety Seminar for ANSPs in the Region- CANSO

3.6.8 The meeting noted that the first CANSO Safety Seminar for the Asia Pacific Region is scheduled in Singapore from 23 to 24 November 2009. The aim of the seminar is to share experiences and ideas on the implementation of Safety Management Systems as well as the importance of safety culture, safety metrics and the exchange of safety data with safety managers of ANSPs in the Region. The seminar will be facilitated by CANSO safety experts drawn from the members of its Global Safety Standing Committee. The meeting urged States to participate in the seminar.

Traffic Forecasts for Trans-Pacific and Intra-Asia/Pacific Region- 14th APATFG

3.6.9 The meeting noted the forecasts developed by 14th Asia Pacific Area Traffic Forecasting Group (APA TFG) in respect of passenger and aircraft movements for both the transpacific and intra-Asia Pacific markets and that the full report is available in ICAO Doc 9915 Asia/Pacific Area Traffic Forecasts 2008-2025. The Report is also published on ICAO web site at <http://www.icao.int/icaonet>. The meeting took note that the forecasts to be developed by 15th APATFG scheduled for 2010 will take into account the full impact of the economic downturn on air transport.

Language Proficiency Implementation Initiative- Nepal

3.6.10 The meeting noted the information provided by Nepal concerning English language proficiency requirement and Civil Aviation Authority Nepal's plan to test their controllers and pilots engaged in international flight operations in English proficiency by end of 2009 in accordance with ICAO's prescribed rating scale.

Status of IFFAS Applications for new regional technical projects-TCB

3.6.11 The meeting noted the information provided by ICAO TCB on the status of the three IFFAS applications. IFFAS has conditionally approved one of the three Grant Applications submitted by the Technical Co-Operation Bureau of ICAO to enhance the three Cooperative Development of Operational Safety and Continuing Airworthiness Programmes (COSCAPs) in Asia to become full-

fledged Regional Safety Oversight Organizations (RSOO). Further steps to implement the programme are planned for late 2009/early 2010. The second Grant Application regarding the establishment of a regional mechanism for dealing collaboratively with accident and incident investigation in different sub-regions is presently awaiting approval by IFFAS. The third application is for Aviation English language training for COSCAP-North Asia which is also pending IFFAS approval.

Training Programmes for Aviation Personnel from Developing Countries

3.6.12 The meeting noted the information provided by Republic of Korea on fellowship Training Programme for aviation personnel from developing countries and its contribution to the balanced development and safety of international aviation.

Updates on Air Navigation Activities in Vietnam

3.6.13 The meeting noted the information provided by Vietnam on their air navigation activities for the year 2008 and 2009 in addition to main coordination activities for the future.

High level Safety Conference -2010

3.6.14 The meeting noted that a High-level Safety Conference is planned to be conveyed from 29 to 31 March 2010 in Montreal. The Conference is intended to bring together the appropriate level of senior management within States' civil aviation authorities to build consensus, obtain commitments and formulate decisions deemed necessary for the effective and efficient progress of key safety activities by ICAO and Contracting States. In this regard, a State letter has been circulated seeking States' comments on the need for the Conference as well as on its proposed draft global objectives and outcomes. The comments by States would assist the Council when it is scheduled to discuss the meeting proposals in November 2009 in order to determine the appropriate level of States' representation at the conference.

Work Programme of ICAO Panels and Study Group

3.6.15 The meeting received the work programme of ICAO ANC Panels and Study groups. The *Panels* are technical groups of qualified experts formed by the ANC of ICAO to advance, within specified time frames, the solution of specialized problems which cannot be solved adequately or expeditiously by the established facilities of the ANC and the Secretariat of ICAO. The use of panels involves examination of specific issues and to find technically feasible solution in terms of initial proposals, for the amendment of ICAO Annexes and PANS which would be acceptable to Contracting States as a whole. The *Study groups*, on the other hand, are small groups of experts made available by States and organizations to assist the Secretariat of ICAO, in a consultative capacity, in advancing the progress on selected technical tasks. The work of study groups may involve the development of initial proposals, similar to panels, for the amendment of ICAO Annexes and PANS for consideration by the ANC.

CNS improvement activities in Nepal

3.6.16 The meeting noted the information provided by Nepal about the activities to improve communication, navigation and surveillance performance. Nepal has reported that RCAG has been commissioned in Nepalgunj to extend the coverage of VHF in the west of Kathmandu. Digital ATIS is planned at Kathmandu and VSAT is planned for Lukla airport to provide voice and data connectivity. In addition to replacing ageing navigation and surveillance systems, Civil Aviation Authority of Nepal has planned to implement PBN in a phased manner

Ionosphere Data Collection -Japan

3.6.17 Highlighting the effect of ionosphere on GNSS operations, Japan urged on the requirement of collecting data and establishing a standard ionosphere model representing unique ionospheric effect on low and mid latitudes. It referred to Australian proposal made to CNS/MET SG/13 for establishing an Ionospheric Study Regional Task Force. In addition to describing in detail the studies that are on going in Japan, it recommended regional collaboration and suggested immediate start of data collection for the solar-max period (2011/2012). States were encouraged to:

- a) facilitate relevant institutions which are capable of conducting observatory works of ionosphere and to immediately start observations and data collections towards the foreseeable solar-max period (2011-2012) especially in the frequency band for GNSS;
- b) keep past observatory data since 2000/2001, if available for research activities to establish a standard ionosphere model representing unique ionosphere behaviors at low and medium latitude in this region; and
- c) cooperate with each other to collect data and characterize ionosphere model in the APAC region that will lead smooth introduction of GNSS in this region;

3.6.18 Australia, while informing the developments that have taken place in the certification environment of GBAS, committed to support the program. India, Indonesia, USA, Philippines, Hong Kong China, Thailand and Singapore also supported the proposals made in the paper. The meeting was of the opinion that efforts towards collection of data to establish a standard ionospheric model should not be related to SBAS implementation only; it is an activity which supports GNSS as a whole and hence should be supported and promoted. Secretariat informed the meeting about the establishment of a Technical Cooperation Project on the subject in CAR/SAM Region.

3.6.19 As result of discussion, meeting agreed to establish Focal Contact Points for each State as the first step. The next step should be further discussed at CNS/MET SG/14 meeting. The meeting acknowledged the offer made by Japan for the services of Electronic Navigation Research Institute (ENRI) to support the activity. In view of the foregoing, the meeting adopted following Conclusion:

Conclusion 20/72 – Ionospheric Data Collection – Focal Point of Contact

That, the States be urged to:

- a) cooperate with each other to collect data and characterize ionosphere model in the APAC region that will lead to smooth introduction of GNSS in ASIA/PAC Region; and
- b) provide the name and contact details of the Focal Point of Contact to ICAO Regional Office for coordinating collection and exchange of ionospheric data with the ultimate objective of establishing a standard ionospheric model for the region.

GBAS Status - Japan

3.6.20 Japan provided information on the development of GBAS to eventually replace the 'high category landing systems'. The meeting was informed of the status of development of prototype GBAS equipment by NEC. It was noted that Preliminary Safety System Analysis and Preliminary Design Review had been completed and the prototype will be installed in the fourth quarter of 2010 and tested in first quarter of 2011. The paper identified the operational benefits that GBAS is going to provide, particularly with reference to the restrictions on ILS performance because of obstructions.

Updates on GAGAN-India

3.6.21 India provided updates on GAGAN. The meeting noted that implementation of Space Based Augmentation System (GAGAN) to deliver APV 1.0/1.5 service is proposed to be completed by June 2013. It was informed that GAGAN will be implemented by establishing and integrating 15 Indian Reference Stations (INRES), 2 Indian Master Control Centre (INMCC), 3 Indian Land Uplink Stations (INLUS) and 3 GEO satellites.

Global Operational Data Link Document (GOLD)

3.6.22 Currently, the Asia/Pacific Region uses the FANS-1/A Operations Manual (FOM) as the basis for data link procedures, whereas the North Atlantic Region uses the Guidance Material for ATS Data Link Services in North Atlantic Airspace (NAT GM). As agreed at the NAT SPG/44 meeting and supported by the APANPIRG/19 meeting, the United States organized an ad hoc working group, comprising representatives from the North Atlantic and Asia/Pacific Regions, to coordinate on terms of reference and a work program to develop a Global Operational Data Link Document (GOLD). The objective is to harmonize all aspects of data link operations and resolve regional differences to the greatest extent possible.

3.6.23 The GOLD is intended primarily for those who are involved in planning and implementation of FANS-1/A data link services (ADS-C/CPDLC) and day-to-day operations, and will be key to harmonizing oceanic and continental (domestic) data link operations worldwide. The Ad Hoc GOLD Working Group is on-track to complete the GOLD by December 2009.

GOLD Contents

3.6.24 In general terms, the GOLD includes the intent of all the guidance material provided by the FOM and the NAT GM. The GOLD has been structured for usability, taking into account different users of a data link system. The following Table provides the GOLD contents and organization for different users:

Type of material	Reference	Description	Intended uses, remarks
Introductory material	Foreword	Purpose, scope, etc.	For all users of the document. Descriptive.
	Chapter 1	Definitions	For all users of the document. Descriptive.
	Chapter 2	Overview of data link operations	For ANSPs and operators to develop training material for personnel, as appropriate, on the fundamentals of data link operations. Descriptive.

Type of material	Reference	Description	Intended uses, remarks
Guidelines	Chapter 3	Administrative provisions related to data link operations	For ANSPs and airspace planners to plan for and implement data link services, including ATC automation, contractual arrangements with CSPs, and interfacility agreements. For operators to plan for and use the data link system.
	Chapter 4	Controller and radio operator procedures	For ANSPs and CSPs to develop procedures and training material for controllers and other personnel at ATSU's.
	Chapter 5	Flight crew procedures	For operators to develop procedures and training material for the flight crew and dispatchers.
	Chapter 6	Advanced data link operations	For ANSPs and operators to develop procedures and training material for personnel, as appropriate, related to advanced data link operations, such as DARP and TA.
	Chapter 7	State aircraft data link operations	For ANSPs and State (military) operators to develop procedures and training material for personnel, as appropriate, related to conducting military operations, such as MARSA and air-to-air refueling.
Appendices (Supporting and Additional Guidelines)	Appendix A	CPDLC message elements and standardized free text messages	For all users. Based on Doc 4444, and includes FANS-1/A and ATN B1 messages.
	Appendix B	RCP specifications	For technical operations specialists, applies to CPDLC, particularly in reduced separation environments.
	Appendix C	Surveillance performance specifications	For technical operations specialists, applies to ADS-C and FMC WPR, particularly in reduced separation environments.
	Appendix D	Post-implementation monitoring and corrective action	State/ANSP, regional, and global levels.
	Appendix E	Regional/State-specific information	Includes differences in data link operations.
	Appendix F	Operator/aircraft specific information	Includes differences in aircraft data link system capability and performance.

3.6.25 As Appendix E of the GOLD includes Region-State Information, and Appendix F includes Operator-Aircraft Information, the Ad Hoc Working Group will need to survey ANSPs, operators, manufacturers, avionics suppliers and other stakeholders. Because these appendices will contain predominantly information rather than guidance material or technical specifications, the Working Group will continue to populate these appendices after release of the document.

3.6.26 The Ad-Hoc Gold Working Group has also recently received requests for inclusion of guidance on additional items. The following items have been deferred until after the initial release of the GOLD, in order to allow time to coordinate the proposals. Once coordination has been finalized, suitable amendments will be made to the GOLD to incorporate appropriate materials.

- a) Use of satellite voice for ATC communications;
- b) Oceanic clearance delivery using ACARS ARINC 623 data link application;
- c) Use of CPDLC free text to convey turbulence information; and
- d) Incorporation of implementation strategy guidelines provided at Appendix H to the FIT BOB/10 report.

GOLD Schedule

3.6.27 The meeting was provided with a copy of version 0.5.0 of the GOLD for review. Copies of version 0.4.3 of the GOLD were provided to the ATM/AIS/SAR/SG/19 (June 2009) and CNS/MET/SG/13 (July 2009) meetings for review and feedback. The circulation draft of the GOLD (version 0.5.0) was provided to the FIT-BOB/11 (August 2009) and Satellite Data Link Operational Continuity Meeting (SOCM, August 2009); both meetings expressed strong support for the GOLD and any feedback would be provided by 30 September 2009. All feedback, completed forms etc should be submitted by email to Mr. Tom Kraft (U.S. - Federal Aviation Administration) at tom.kraft@faa.gov.

3.6.28 The GOLD Ad-Hoc Working Group is now working to the following review schedule:

Dates	Description	Status
22-26 June 09	APAC 19 th ATM/AIS/SAR Sub Group (v 0.4.3)	Done
23-26 June 09	NAT SPG/45 (Paris) – Update	Done
20-24 July 09	APAC 13 th CNS/MET Sub Group (v0.4.3)	Done
Jul-Aug 09	GOLD – v0.4.4, v0.4.5, v0.4.6, & v0.4.7	Done
6 Aug 09	distribute GOLD – v0.5.0 (circulation draft for wide review)	Done
24-25 Aug 09	FIT BOB/11 and Data Link Seminar (Bangkok, v0.5.0)	Done
26-28 Aug 09	Satellite Data Link Operational Continuity meeting (SOCM, Bangkok, v0.5.0)	Done
Sep 09	update GOLD after wide review	In progress
Sep 09	APANPIRG/20 (Bangkok)	Now
Sep/Oct 09	NAT CNSG/1 (Paris)	Planned
Oct 09	IPACG/31 (Tokyo)	Planned
Nov 09	NAT IMG/35 (Reykjavik)	Planned
Feb/Mar 10	ISPACG/24 (Nadi)	Planned
Jun 10	NAT SPG/46 (Paris)	Planned

Adoption of the GOLD

3.6.29 The GOLD incorporates the most recent advances in data link matters including consideration of ICAO's Required Communications Performance (RCP) provisions as well as technical specifications and guidance on post-implementation monitoring, based on RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard).

3.6.30 The Ad-Hoc GOLD Working Group, which includes representation from ICAO HQ and the EUR/NAT and APAC Regional Offices, is targeting completion of an operational edition of the GOLD by the end of December 2009; promulgation of the GOLD is expected early in 2010. The meeting learned that because the recent work had been concentrated on preparing the GOLD, the FOM was now out of date and there was no expectation that the FOM would be updated as it would be replaced by the GOLD.

3.6.31 The United States and others joined IATA in recognizing that the GOLD supersedes the FOM and represents a very significant step towards the global harmonization of ADS-C and CPDLC procedures for pilots and ATCOs. As the GOLD builds on existing provisions in the FOM, transition from the FOM to the GOLD is not expected to introduce significant implementation issues and implementation will be coordinated via the Regional Office and the regional ATS Coordination Groups. The meeting formulated the following Conclusion:

Conclusion 20/73 – Adopt GOLD to replace FOM

That, upon release of the Global Operational Data Link Document (GOLD) by the Ad-Hoc GOLD Working Group in first quarter 2010, the FANS-1/A Operations Manual (FOM) be withdrawn and replaced by the GOLD as Asia/Pacific regional guidance material for use by States and airspace users as the basis for operating Automatic Dependent Surveillance – Contract (ADS-C) and Controller Pilot Data Link Communications (CPDLC), in conjunction with *Annex 10 – Aeronautical Telecommunications Volume II – Communications Procedures including those with PANS status* and the *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM Doc 4444)*.

GOLD Change process

3.6.32 After a Planning and Implementation Regional Group (PIRG) has endorsed the initial release of the GOLD, it will be maintained as a regional document in coordination with participating PIRGs providing data link services within their region. Each PIRG will establish a mechanism for submitting and administering change proposals via the respective Regional Offices.

3.6.33 Any stakeholder will be able to submit a change proposal to their ICAO Regional Office. The Regional Office will coordinate the change proposal within its own region, other regions, and with ICAO HQ, to determine the acceptability of the change proposal. Once coordination has been completed and the change proposal is accepted, the change will be incorporated into the GOLD.

**AGENDA ITEM 4: REGIONAL AIR NAVIGATION
DEFICIENCIES**

Agenda Item 4: Regional Air Navigation Deficiencies

4.1 The meeting noted that APANPIRG/19 placed highest priority in its future work programme on the urgent elimination of the safety related deficiencies in the region and urged States to establish action plans with target dates, and to inform the Regional Office of their plans. The meeting recalled the APANPIRG Conclusion 18/58 on the provision of a regional on-line database for air navigation deficiencies and urged States to resolve the air navigation deficiencies.

4.2 The meeting thanked IFALPA for providing the Regional Office with information on deficiencies at airports in the Asia/PAC Regions and requested its continuous support in future. Recognizing the importance of safety in aviation the meeting urged States to resolve their air navigation deficiencies. Noting that 15 states and one administration have provided the focal point for resolution of deficiencies, the meeting urged the States who have not done so to provide the focal point to Regional office at the earliest.

Deficiencies in the ATM/AIS/SAR fields

4.3 The review by RASMAG/11 of the list of the Air Navigation Deficiencies in the ATM, AIS and SAR fields, noted that Myanmar and Papua New Guinea (PNG) had previously been included in the list as a result of the non-submission of safety data to a regional monitoring agency (RMA). In the case of Myanmar, the difficulties had been resolved and APANPIRG accepted RASMAG's recommendation that Myanmar be removed from the list. However, although the situation with PNG had improved, data submission was still not fully reliable, so PNG would be retained on the list. Additionally, data submission from Bangladesh and Lao PDR has been incomplete or absent, so APANPIRG included the two States as additions to the Deficiencies List. In the respect, Bangladesh advised the meeting that they were aware of the difficulty and hoped to have arrangements in place for the data to be transmitted to the RMA within the next few weeks.

4.4 Subsequent to ATM/AIS/SAR/SG/19, Cambodia provided evidence to the Regional Office that the implementation of WGS-84 had been undertaken, so this deficiency was removed from the list. Additionally, Cambodia had submitted a proposal for amendment in relation to ATS route R345. The amendment proposal for ATS route R345 had been in circulation among States and international organizations with the response date of 18 September 2009. China informed the meeting that three ATS routes across the Taiwan Strait had recently been established, one of which is the B591 required by the BANP. Accordingly, the meeting agreed that the deficiency for China of B591 could be deleted from the list.

4.5 The updated List of Air Navigation Deficiencies in the ATM, AIS and SAR fields is in **Appendix A** to the report on agenda item 4.

Deficiencies in the AOP field

4.6 The following updates from States/ICAO mission have been received.

4.7 Myanmar has advised that the final overlay work on the runway at Yangon International Airport was completed in 2005. Runway extension to the northern portion has also been completed and opened for aircraft operations since 10 June 2008. Myanmar has provided a copy of Bangkok Airways pilot report dated 20 May 2009 about the good condition of runway. In addition it is reported that Precision approach Category I lighting system is available for runway 21 and simple approach lighting system is being installed for runway 03 and expected date of completion is September 2009.

4.8 New Zealand advised that the construction of a 90m RESA at the northern end of Wellington International Airport runway has been completed and is operational effective from 25 September 2008.

4.9 Nepal advised that the temple which infringed the transitional surface has been dismantled completely. Nepal informed the meeting that strengthening and overlay work on the runway at Tribhuvan International Airport is ongoing and expected date of completion is August 2010. In addition Civil Aviation Authority of Nepal (CAAN) has finalized the airport master plan and implementation of RESA is expected by 2014. Further CAAN is also working on the corrective action plan and will submit to the ICAO Regional Office by end of September 2009.

4.10 Philippines advised that corrective action has been taken to prevent unauthorized persons/wildlife by providing perimeter fence at the airport and a wildlife hazard management is in place.

4.11 The meeting noted that the Regional Office has assessed the IFALPA information and AGA mission findings in accordance with the established procedures and requested the concerned States to validate the status.

4.12 The updated List of Air Navigation Deficiencies in the AOP field is in **Appendix B** to the report on Agenda Item 4.

Deficiencies in the CNS field

Air-ground VHF Communication in Yangon FIR

4.13 Status of operation of the RCAG stations operating in Lashio, Mandalay, Sittwe, Myeik and Patheingyi in addition to the local VHF station at Yangon was reviewed. It was reported that interruption of power supply at remote stations still continue to be an issue and Myanmar had planned to upgrade the solar power supply systems at two remote stations. Review of a report provided by IATA in February 2009 revealed that 70% of the reports indicated normal operations. Myanmar had requested IATA and the airspace users to provide the feedback timely and should include following information as minimum.

- Time of occurrence and position of occurrence added in the report template;
- ATS Route No. and the closest waypoint when problem experienced;
- Flight level which is important to analyze the coverage of RCAG; and
- Report required to be forwarded to DCA Myanmar as soon as possible preferable within 1 to 2 days of occurrence.

ATIS function at Kathmandu and Dhaka airports

4.14 It was informed that ATIS at Kathmandu had been implemented and official notification to this effect has been received from Nepal. The CNS/MET SG agreed with the recommendation to remove this item from the Deficiencies List for CNS facilities.

4.15 With respect to status of ATIS at Dhaka Airport, Bangladesh informed the meeting that ATIS has been installed and operational since August 2008. The meeting appreciated the remedial action taken by the Administration which was requested to provide official notification to ICAO Regional Office for verification and removal from the deficiency list.

Manila-Hong Kong AFTN and ATS Direct Speech Circuits

4.16 Information on the status of operation of the two circuits has been provided. CNS/MET SG appreciated the efforts put in by both Philippines and Hong Kong China in restoring operation on both these circuits. Hong Kong China updated the outage status for both the circuits for the month of June and August 2009 and urged CAA Philippines to take active action to rectify the problem with the service provider and improve the performance of the circuits. Philippines has assured the early restoration of the circuits in close coordination with Hong Kong China.

HF Communication problem in Mumbai FIR

4.17 CNS SG was informed about the concerns on HF air-ground communications in Mumbai FIR. It was reported that follow-up actions were taken by the Airport Authority of India and the communications had improved to an extent. FANS 1/A based ADS/CPDLC service is also provided in Mumbai FIR. However, negative contacts on the route B459 have been reported by an operator in June 2009. The matter was being investigated by the ANSP. India informed that a detailed study has been undertaken and steps taken to improve the operations. India was of the opinion that the problem will be completely mitigated once all the actions are completed within the next four to six months.

4.18 The updated List of Air Navigation Deficiencies in the CNS field is in **Appendix C** to the report on Agenda Item 4.

Deficiencies in the MET fields

4.19 The meeting was informed that the list of deficiencies updated at the APANPIRG/19 meeting included 15 deficiencies in the MET field related to 10 States. They consisted of OPMET deficiencies, lack of MWO, creation and issuance of SIGMET (WS, WC and WV), and need for issuance of volcanic activity to ACCs and MWOs. Since APANPIRG/19, information on the status of deficiencies was obtained by various means (State letters, meetings and ICAO TCB) and those with updates reflected in **Appendix D**.

4.20 The meeting noted that the ICAO Regional Office was informed by DPR Korea of the establishment of a Meteorological Watch Office (MWO) at the Pyongyang International Airport that serves the Pyongyang FIR effective February 2009. As agreed upon at the OPMET/M TF/7 and CNS/MET SG/13 meetings, the issuance of SIGMET for the Pyongyang (ZKKP) FIR needs to be verified by a RODB and to take advantage of the active convective months from June – August when convective SIGMET is most likely to occur. Monitoring for the reception of SIGMET issued by Pyongyang MWO occurred for the periods 9-30 June 2009, 18-31 July 2009 and 1-14 August 2009. No SIGMET was received by the monitoring RODB for the 50 days monitored. Given the aforementioned, **Appendix D** notes the progress reported by the State in establishing a MWO and encourages the State to provide SIGMET to the RODBs via AFTN (Bangkok (VTBBYPYX), Brisbane (YBBBYPYX), Nadi (NFZZRFX), Singapore (WSZZYPYM) and Tokyo (RJTDYPYX)) which would allow users to access this vital hazardous weather information. Subsequently, APANPIRG Air Navigation Deficiency AP-MET-16 would be considered for removal from the list of APANPIRG Air Navigation Deficiencies in the future.

4.21 The meeting noted the bilateral agreement between the Air Traffic Management Bureau (ATMB) of the Civil Aviation Administration of China (CAAC) for the provision of SIGMET by the Kunming (ZPPP) MWO for the Phnom Penh (VDPP) FIR on behalf of the Flight Operation and Safety Department (FOSD) of the State Secretariat of Civil Aviation of Cambodia (SSCA)

became effective 1 June 2009. The agreement is renewable automatically each year providing there is no disagreement before 30 days of the renewal date 1 June. Reception of SIGMET issued by the Kunming MWO for the Phnom Penh FIR has been verified at the Singapore Brisbane, and Bangkok RODBs as well as SADIS. With the aforementioned, the meeting adopted the following Conclusion.

Conclusion 20/74 – Removal of the APANPIRG Air Navigation Deficiency AP-MET-15

That, the air navigation deficiency AP-MET-15 be removed from the APANPIRG air navigation deficiencies list.

4.22 ICAO commended China and Cambodia for their effort and coordination in mitigating this urgent MET deficiency and noted that this agreement is being used as an example and template in other Regions and States.

4.23 The meeting agreed that the deficiency AP-MET-11 for the establishment of a MWO for the Phnom Penh FIR remain on the list of APANPIRG air navigation deficiencies since other duties such as the dissemination of information on a radioactive material release as referenced in Annex 3, 3.4 are MWO responsibilities in addition to the provision of SIGMET.

4.24 The meeting noted recent progress in Myanmar with regards to AP-MET-10, pre-flight documentation in that SADIS FTP is expected to be operational by the end of 2009. Validation of the deficiency will be provided to the Regional Office in the form of a copy of a subset of WAFS forecasts that are included in a preflight briefing package. With regards to the second of two MET deficiencies in Myanmar, AP-MET-13, the Singapore RODB verified the reception of SIGMET by the Yangon (VYYY) MWO during the 13 to 30 June 2009 monitoring period. For further verification, airline satisfaction (i.e. IATA monitoring) and an official letter from the State is expected by the end of 2009. ICAO commended Myanmar for its continued efforts in mitigating MET deficiencies.

4.25 The meeting was informed of deficiencies identified in the South-West Pacific Island States reported by the ICAO Technical Cooperation Project *Cooperative Agreement for Enhancement of the Meteorological Service for Aviation in the South Pacific (CAEMSA-SP)* which was conducted from August to December 2009. Eight Pacific Island States, Cook Islands, Fiji, Kingdom of Tonga, Kiribati, Nauru, Samoa, Solomon Islands, and Vanuatu participated in the CAEMSA-SP. The ICAO TCB Technical Expert visited seven of the eight States and developed a list of action items associated with identified gaps given in **Appendix E**. The actions performed with identified gaps and associated target dates would achieve compliance to Annex 3 and improve the State's ability to meet the next round of USOAP audits in relation to meteorology services to aviation. The CNS/MET SG/13 meeting noted that gaps associated with lack of or outdated documents can be overcome by the distribution of current WMO and ICAO documents, specifically if the missing or outdated documents are known.

4.26 The meeting noted that a total of 10 deficiencies were recommended for inclusion to the list of APANPIRG Air Navigation Deficiencies by the ICAO TCB Technical Expert, but two of these (AP-MET-01 and AP-MET-02) were already APANPIRG deficiencies. The remaining 8 proposed deficiencies were presented to the OPMET/M TF/7 meeting (2-4 June 2009, Bangkok) where it was decided by the meeting that 5 of the 8 deficiencies indicated in **Appendix F** be presented to the CNS/MET SG/13 meeting for further scrutiny and formulate a proposed list with associated deficiency type (urgent or top priority) to the APANPIRG/20 meeting.

4.27 The CNS/MET SG/13 meeting made reference to the process of assigning a deficiency status. That is, U (urgent) status is reserved for an ICAO standard and A (top priority) status is reserved for recommended practices. Therefore, the lack of METAR data, WAFS forecasts

for pre-flight planning and volcanic ash monitoring would be tagged with the U status. In view of the discussion above, the meeting adopted the following Conclusion.

Conclusion 20/75 – MET deficiencies to be added to the APANPIRG list of Air Navigation Deficiencies

That, the list of proposed air navigation deficiencies in **Appendix F** to the APANPIRG/20 Report on agenda item 4 obtained by the ICAO TCB CAEMSA-SP reports be added to the list of APANPIRG air navigation deficiencies list tagged with the U status.

4.28 The meeting noted the difficulties associated in mitigating the gaps in MET service in the South Pacific in that cost recovery is not sufficient to cover the costs of meeting Annex 3 requirements. As noted in the CNS/MET SG/13 meeting, Bhutan drew a parallel to the cost recovery difficulty in that only a handful of flights utilize their international aerodrome each day. The meeting noted that a viable solution would be to consolidate MET Services and broaden the area influenced by one MET Service Provider to retrieve costs comparable to the service required. With that, the CNS/MET SG/13 meeting agreed that a proposal be introduced in a future meeting that would invite ICAO to provide guidance in retrieving cost recovery for such States where the aerodromes are mainly used for alternate aerodromes in flight planning.

4.29 The meeting noted that in the meantime, significant resources are necessary to fulfill the MET requirements for those States, which requires ongoing effort by States, ICAO, WMO and donor States. Given the scope of gaps and deficiencies identified, the continuation of CAEMSA-SP in coordination with the ICAO Regional Office, the Pacific Aviation Safety Office (PASO), WMO and signatory States was considered necessary to execute the actions detailed in **Appendix E**. With the continuation of CAEMSA-SP, the risk to airline safety would be reduced and airlines would be enabled to carry less fuel utilizing vitally located alternate aerodromes in the South Pacific. With that, the meeting agreed that resources and donations were needed to produce the safety and efficiency required by airlines operating in the South Pacific. Given the aforementioned, the meeting adopted the following Conclusion.

Conclusion 20/76 – Continuation of CAEMSA-SP

That, the DGCA/46 conference considers funding and resources be allotted by donor States, WMO, and ICAO for the continuation of the CAEMSA-SP in order to meet international requirements in the provision of meteorological services which would achieve the necessary safety and efficiency levels for airlines operating in the South Pacific.

4.30 The updated List of Air Navigation Deficiencies in the MET field is in **Appendix D-** to the report on Agenda Item 4.

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AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

<i>(updated 10 September 2009)</i>								
Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>ATS Routes</u>								
Requirements of Part VIII, Table ATS 1 of the Air Navigation Plan	India/Nepal	A473 - Not implemented	16/3/99	A new proposal was submitted in mid-2003 by Nepal. This is being coordinated by AAI with defense authorities.	Nepal - propose to delete A473 from BANP. India submitted the proposal in March 2008. Nepal yet to submit.	Nepal	Item captured in Chapter 2 of the Route Catalogue. APANPIRG/19 (September 2008) updated re progress.	B
	China	B591 – Partially implemented	22/7/97		China will consider future implementation.	China	Reviewed by ARNR/TF. Item captured in Chapter 2 of the Route Catalogue. ATM/AIS/SAR/G/16 (June 2006) updated – route implemented in Shanghai FIR, however implementation is not in accordance with BANP, further implementation TBD	B
	Philippines/Thailand/Viet Nam	G473 - Partially implemented	24/11/93	Co-ordination is in progress among States and ICAO.	Philippines/ Thailand/Viet Nam – propose deletion from BANP. States need to submit amendment proposals to Regional Office. ICAO - process the amendment the BANP	Philippines Thailand/Viet Nam ICAO	Superseded by the re-structure of the South China Sea (SCS) route in 2001. Accordingly, SEACG/15 (May 2008, Bangkok) was informed that Thailand and States concerned agreed with the deletion of G473.	B

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	China	R216 - Not implemented	24/11/93	China advised current route B215 KUQA A460 REVKI to Alma Ata met the requirements for traffic from Urumqi to Alma Ata and requests deletion of R216 from BANP (14 Apr 03).	CAAC will coordinate with Kazakhstan to delete R216 from BANP.	China/Kazakhstan ICAO	Captured in Chapter 2 of the Route Catalogue.	B
	Cambodia/Lao PDR/Thailand	R345 - Not implemented. ~~Under the e~~ Coordination process <u>completed</u> .	24/11/93			~~Cambodia/Lao PDR/ Thailand~~ needs to submit joint amendment proposal to Regional Office	Item captured in Chapter 2 of the Route Catalogue.	B
	Indonesia	R459 - Implemented as W51 and W36	24/11/93	ICAO has requested Indonesia to implement as R459.	Indonesia, Singapore - consider implementation of the route with designator L504.	Indonesia/Singapore	To be implemented as L504. Target implementation date TBD	B

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
WGS-84								
Requirements of Paragraph 3.6.4 of Annex 15	Bhutan	WGS-84 - Not implemented	2/7/1999	Data conversion completed, but not published		Bhutan	TBD	A
	Cambodia	WGS-84 - Partially implemented	28/6/2001	~~Cambodia reported to ATM/AIS/SAR/SG/18 on 26 June 2008 that WGS-84 coordinates had been implemented at international airports, airspace and international routing. Domestic airports and routes have not been implemented with WGS-84.~~		Cambodia	2009/2010 Completed. Reported to the Regional Office on 13 July 2008	A
	China	WGS-84 - Partially implemented * implemented in the Sanya FIR as of 1 Nov 2001	2/7/1999	Differences to Annex 15 - <i>Aeronautical Information Services</i> are notified		China	China advised APANPIRG/19 (September 2008, Bangkok) that WGS 84 implementation is in progress and planned to be completed in 2010 for all existing airports. All new airports will use WGS84 immediately.	A
	DPR Korea	WGS-84 - Not implemented				DPR Korea	DPRK advised ATM/AIS/SAR/SG/18 verbally that WGS 84 implementation was completed. The Regional Office is waiting for a formal report.	A
	Kiribati	WGS-84 - Not implemented				Kiribati	TBD	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Nauru	WGS-84 - Not implemented		Conferring with consultant		Nauru	TBD	A
	Solomon Islands	WGS-84 - Not implemented				Solomon Islands	1999	A
	Vanuatu	WGS-84 - Implemented at main airports	2/7/1999			Vanuatu	1999	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>Airspace Classification</u>								
Requirements of Paragraph 2.6 of Annex 11	China	Airspace Classification - Not implemented	7/7/99		Difference to Annex 11 is published in AIP, China.	China	APANPIRG/19 updated, implementation planned by end 2010.	A
	~~DPR Korea~~	~~Airspace Classification - Not implemented~~	~~7/7/99~~			~~DPR Korea~~	~~mid-2009~~ completed in July 2009	A
	Kiribati	Airspace Classification - Not implemented	7/7/99			Kiribati	TBD	A
	Nauru	Airspace Classification - Not implemented	7/7/99			Nauru	TBD	A
	Papua New Guinea	Airspace Classification - Not implemented	7/7/99			Papua New Guinea	Project in place	A
	Solomon Islands	Airspace Classification - Not implemented	7/7/99			Solomon Islands	TBD	A
	Viet Nam	Airspace Classification - Not implemented	7/7/99			Viet Nam	APANPIRG/19/ATM/AIS/SAR/SG/19 updated, for firstfourth quarter 2009	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>AIP Format</u>								
Requirements of Chapter 4 of Annex 15	Cook Islands	AIP Format - Not implemented	7/7/99			Cook Islands	ATM/AIS/SAR/G/16 (June 2006) updated - AIP COOK ISLANDS in new format in progress with assistance of New Zealand, effective date by the end of 2008	A
	Kiribati	AIP Format - Not implemented	7/7/99			Kiribati	ATM/AIS/SAR/SG/18 (June 2009) was advised AIP in draft stage	A
	Nauru	AIP Format - Not implemented	7/7/99			Nauru	ATM/AIS/SAR/SG/18 (june 2008) was advised work soon to start	A
	Papua New Guinea	AIP Format - Not implemented	7/7/99			Papua New Guinea	TBA	A

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>SAR capability</u>								
Requirements of Annex 12	Cook Islands	Annex 12 requirements not implemented. No agreements with adjacent States.	31/1/95		Cook Islands - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Cook Islands	2009. SAR agreement with New Zealand completed 2007.	U
	Maldives	Annex 12 requirements not implemented. No agreements with adjacent States.	24/4/97	SAR services and facilities provided (details to be confirmed). SAR agreements with neighbouring States under development	Maldives - implement Annex 12 requirements and co-ordinate LOA with adjacent States ICAO - assist to develop SAR capability and to co-ordinate with adjacent States	Maldives	2009	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>Carriage of ACAS II</u>								
Requirement of Chapter 6 of Annex 6	Bhutan	Annex 6 requirement not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
	Cook Islands	Annex 6 requirement not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
	Kiribati	Annex 6 requirement not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
	Marshall Islands	Annex 6 requirement not implemented.	26/8/05		Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
	Micronesia	Annex 6 requirement not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
	Nauru	Annex 6 requirement not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
	Palau	Annex 6 requirement not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
	Papua New Guinea	Annex 6 requirement not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	TBD	U
	Solomon Islands	Annex 6 requirement not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Tonga	Annex 6 requirement not implemented.	26/8/05		Tonga - implement Annex 6 as required.	Tonga	~~TBD~~ <u>Tonga-advised ATM/AIS/SAR/SG/19 verbally that ACAS II implementation was</u>	U
	Vanuatu	Annex 6 requirement not implemented.	26/8/05	Pressure altitude reporting transponder required in all airspace since 1/1/00.	Vanuatu - implement Annex 6 as required.	Vanuatu	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>Carriage of Pressure Altitude Reporting Transponder</u>								
Requirement of Chapter 6 of Annex 6	Bhutan	Annex 6 requirement not implemented.	26/8/05		Bhutan - implement Annex 6 as required.	Bhutan	TBD	U
	Cook Islands	Annex 6 requirement not implemented.	26/8/05		Cook Island - implement Annex 6 as required.	Cook Islands	TBD	U
	Kiribati	Annex 6 requirement not implemented.	26/8/05		Kiribati - implement Annex 6 as required.	Kiribati	TBD	U
	Marshall Islands	Annex 6 requirement not implemented.	26/8/05	ACAS II required.	Marshall Islands - implement Annex 6 as required.	Marshall Islands	TBD	U
	Micronesia	Annex 6 requirement not implemented.	26/8/05		Micronesia - implement Annex 6 as required.	Micronesia	TBD	U
	Nauru	Annex 6 requirement not implemented.	26/8/05		Nauru - implement Annex 6 as required.	Nauru	TBD	U
	Palau	Annex 6 requirement not implemented.	26/8/05		Palau - implement Annex 6 as required.	Palau	TBD	U
	Papua New Guinea	Annex 6 requirement not implemented.	26/8/05		Papua New Guinea - implement Annex 6 as required.	Papua New Guinea	TBD	U
	Solomon Islands	Annex 6 requirement not implemented.	26/8/05		Solomon Islands - implement Annex 6 as required.	Solomon Islands	TBD	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
	Tonga	Annex 6 requirement not implemented.	26/8/05	<u>ACAS II required.</u>	Tonga - implement Annex 6 as required.	Tonga	~~TBD~~ Tonga-advised <u>ATM/AIS/SAR/SG/19 verbally that the pressure altitude reporting.</u>	U

AIR NAVIGATION DEFICIENCIES IN THE ATM/AIS/SAR FIELDS IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirements	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action**
<u>Non Provision of Safety-related Data</u>								
Requirement of Paragraph 3.3.4.1 of Annex 11	<u>Bangladesh</u>	<u>Annex 11 requirement not implemented.</u>	<u>11/9/09</u>		<u>Bangladesh - provide the safety-related data as required.</u>	<u>Bangladesh</u>		<u>U</u>
	<u>Lao PDR</u>	<u>Annex 11 requirement not implemented.</u>	<u>11/9/09</u>		<u>Lao PDR - provide the safety-related data as required.</u>	<u>Lao PDR</u>		<u>U</u>
	<u>Myanmar</u>	<u>Annex 11 requirement not implemented.</u>	<u>21/8/06</u>		<u>Myanmar —provide the safety-related data as required.</u>	<u>Myanmar</u>	<u>TBDcompleted</u>	<u>U</u>
	<u>Papua New Guinea</u>	<u>Annex 11 requirement not implemented.</u>	<u>21/8/06</u>		<u>Papua New Guinea - provide the safety-related data as required.</u>	<u>Papua New Guinea</u>	<u>TBD</u>	<u>U</u>

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN AOP FIELD IN THE ASIA/PACIFIC REGION

- 1 -Identification		Deficiencies			Corrective Action			
Requirements	State/facilities	Description	Date first reported	Remarks	Description	Executing body	Date of completion	Priority for action
Annex 14 Vol. I § 3.1.22	Myanmar Yangon/ Mingaladon	New runway surface slippery when wet.	2003	Surface of a paved runway shall be so constructed as to provide good friction characteristics when runway is wet.	RWY surface replaced; no new reports from airlines ~~Final RWY layer still to be completed (update 2005)~~ Runway overlay completed in 2005 and extension completed in June 2008	DCA, Myanmar	~~On-going~~ Completed	"A"
Annex 14 Vol. I Amendment 6 § 10.1 § 10.2				A maintenance programme should be established to maintain facilities in a condition which does not impair safety of air navigation.				"A"
Annex 14 Vol. I § 5.3.4		No approach Lighting RWY 03	1994	PAPI installed in 2002. Approach lights to be Installed when funds available.	Precision approach Cat I available for runway 21 and simple approach being installed for rwy 03.	DCA Myanmar	End of 2009	A
Annex 14 Vol. I § 4.2	Nepal Kathmandu	Top of temple infringes the transitional surface	2003	Airspace around aerodromes to be free from obstacles as defined by the obstacle limitation surfaces for safe aircraft operation.	~~Verbal negotiations with the stake holders for dismantling the temple subject to replacement to other place have been made. It is under the process of relocation to the suitable place.~~ Temple dismantled	CAAN	Apr. 2005 Mid July 2008 Completed	"U"

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- 1 -Identification		Deficiencies			Corrective Action			
Requirements	State/facilities	Description	Date first reported	Remarks	Description	Executing body	Date of completion	Priority for action
Annex 14 Vol. I § 3.4	New Zealand Wellington	Runway-end safety areas RWY 16/34 inadequate.	2000	RESA shall be provided and shall extend from the end of a runway strip for a distance of at least 90 m.	A 90 m RESA at the southern end of RWY under construction — completion estimated April 2007. Completed. A 90 m RESA at the northern end of RWY to start before the end of 2006 is under construction with completion estimated December 2007 date of 30 June 2008 Completed.	Civil Aviation Authority	~~2007~~ COMPLETED 30 June 2008 COMPLETED	“U”

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- 1 -Identification		Deficiencies			Corrective Action			
Requirements	State/facilities	Description	Date first reported	Remarks	Description	Executing body	Date of completion	Priority for action
Annex 14 Vol. 1 Amendment 6 § 9.10.1 § 9.10.2	Philippines Manila	Airport security lax, allowing livestock to stray on to active runways.	2004	Improved airport perimeter fencing and general security within the perimeter of the airport required.	~~Currently projects are incessantly being pursued to further minimize wild life related incidents.~~ Security fence provided and wildlife management is in place.	Civil Aviation Authority of Philippines	COMPLETED	"A"

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE CNS FIELD IN THE ASIA/PACIFIC REGION

Identification		Deficiencies			Corrective Action			
Requirement	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action
Provision of ATIS as specified in FASID Table CNS 2 (Doc 9673)	Bangladesh	To broadcast current, routine terminal information to arriving and departing aircraft to ease congestion on the Tower and Approach channels affecting safety of aircraft operation.	May 2007	Provide aerodrome Terminal Information broadcast system to ease congestion on VHF and to reduce controllers work load	The ATIS equipment installed has been out of service due to maintenance problem and is beyond repair. It is required to provide a new equipment. New ATIS equipment had already been installed and put into trial operation on 14 May 2008. Effort is required to resolve the technical problem and provide ATIS for operational use within shortest possible time. Further updates on the Status are required. The ATIS equipment has been installed and operational since August 2008	Civil Aviation Authority of Bangladesh	September 2009 Official notification of the normal operation of the ATIS and request for removal this deficiency from the deficiency list is expected from Bangladesh	A
Adequate and reliable VHF COM	Myanmar	Quality and reliability of RCAG VHF inadequate and unavailability of required coverage. Improvement has been observed and pilot reports continued to indicate occasional communication difficulties. Further improvement has been observed with occasional communication problems reported.	1998 Early 2008 Feb. 2009	Improvements in the quality of link to RCAG stations and power supply system are required.	Action should be taken to provide reliable links between the RCAG stations and Yangon ACC. ICAO missions were conducted. An action plan was developed to upgrade equipment at RCAG stations, provide VSAT link at all RCAG stations, to improve power supply system. DCA Myanmar has replaced equipments at all 6 RCAG sites with digital VHF system and has provided VSAT links and solar power supply system at all sites. New HF transmitters were used to provide service to aircraft flying beyond VHF coverage in a small portion of Yangon FIR	DCA Myanmar	Revised target date is end of 2009 This deficiency will be removed from the list upon receipt of official report providing full details of action taken by Myanmar and confirmation by the users.	A

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Identification		Deficiencies			Corrective Action			
Requirement	States/facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action
Requirement for provision of ATIS as specified in FASID Table CNS2 (Doc. 9673 Vol.II)	Nepal	To broadcast current, routine terminal information to arriving and departing aircraft to ease congestion on the Tower and Approach channels affecting safety of aircraft operation.	April 2005	Provide aerodrome Terminal Information broadcast system to ease congestion on VHF and to reduce controllers work load	ATIS equipment provided in 2001 remained unusable due to technical problem which is still under investigation and rectification. On 14 March 2008, Nepal informed that ATIS TIA revived since 5 November 2007 on reduced range condition. It was under maintenance for normal operation. Nepal advised on 21 August 2008 that ATIS is functioning normal.	Civil Aviation Authority of Nepal	September 2008 Official notification of the normal operation of the ATIS and request for removal this deficiency from the deficiency list was received from Nepal on 29 August 2008.	A
Requirements for provision of AFS circuits between Hong Kong and Manila is specified in FASID Table CNS 1A and 1D (Doc.9673 Vol.II)	Philippines	Total disruption of the AFTN circuit between Manila and Hong Kong after Philippines Long Distance Telephone Company (PLDT) failed to provide communication link between Manila and Hong Kong. The fluctuation of service availability of AFTN circuit and ATS direct speech circuit were recently observed from total outage of 4,000 minutes in June to over 13,000 minutes in August 2009	February 2007 June 2009	It is urgently required to improve the performance of the AFTN circuit to meet the requirement for the exchange of safety messages between Manila and Hong Kong within the established transit time of 5 minutes. It is also required to restore normal operation of the ATS direct speech circuit as soon as possible.	Prolonged delay in rectification of problem experienced at Manila has resulted in diversion of message traffic for a long time via Taipei with alternate routing via Hong Kong/Fukuoka/Singapore/Manila causing traffic congestion as well as higher transit time of AFTN message. Remedial actions for improvement of the circuit performance were discussed among ICAO Secretariat, Hong Kong CAD and the CAAP Philippines. ICAO mission was carried out and action plan was developed.	Civil Aviation Authority of the Philippines (CAAP)	By the end of September 2009 The circuit was resumed operational on 4 May 2008. However, the unstable and unreliable performance of the circuits is not acceptable. The Philippines is urged to rectify the deficiencies of the AFTN and ATS direct speech circuits without further delay.	U

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
Meteorological observations and reports. (Annex 3, Chapter 4)	Solomon I.	Weather information is inadequate and not provided on a regular basis	1996 Confirmed 2006 SOA	Reported by airlines operating to Solomon I.	Equipment to be upgraded and arrangements to be made for regular observations TC expert recommendation to replace and/or calibrate MET obs. equipment AGGH	Ministry of Transport, Works and Aviation, Solomon I. <i>Note: OPMET/M TF to carry out survey</i> State made aware of MET Services gaps identified by ICAO TC Project, CAEMSA-SP, in late 2008	2009	A
Meteorological observations and reports. (Annex 3, Chapter 4)	Kiribati	METAR from Kiribati not available on regular basis.	1998 Confirmed 2005 SIP	Reported by airlines	State's MET authority to consider urgent action to be taken for providing regular observations and reports TC expert recommendation to purchase/install AWOS	Directorate of Civil Aviation, Kiribati. <i>Note: OPMET/M TF to carry out survey</i> ICAO SIP conducted in 2005 State made aware of MET Services gaps identified by ICAO TC Project, CAEMSA-SP, in late 2008	2009/2010	A

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Indonesia	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Three-party LOA to be signed between the MGA, DGCA and DVGHM	DGCA, MGA Indonesia Information exchange between CVGHM & ABA in draft form. VSAT comms installed to improve the monitoring in E Nusa Tenggara -- provides direct transfer of data to CVGHM HQ full time. (AusAID-funded project) Bilingual reporting form based on VONA to improve comm. to VAAC in Sulawesi	TBD (no action plan submitted to RO)	A
Reporting of information on volcanic eruptions to civil aviation units. (Annex 3 p. 4.14 (recom.))	Papua New Guinea	Information on volcanic activity not provided regularly to ATS units and MWOs.	1995 Confirmed by ICAO SIP mission Dec 2003	Observed by States concerned. Reported at the WMO/ICAO Workshop on Volcanic Ash Hazards (Darwin, 1995)	Procedures to be set up for exchange of data between NWS, ATS and Rabaul Volcano Observatory (RVO) and a LOA to be signed	NWS, ATS Papua New Guinea <i>Note: ICAO Regional Office to monitor</i> Discussion of an agreement between RVO & PNG CAA to provide volcanic information to aviation through cost recovery is underway.	TBD (no action plan submitted to RO)	A

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
Provision of SIGMET for volcanic ash (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Indonesia Philippines Papua New Guinea	Requirements for issuance and proper dissemination of SIGMET, including SIGMET for volcanic ash, have not been fully implemented	ICAO SIP mission Dec 2003	a) Reported by airlines b) Noted by Volcanic Ash Advisory Centres	a) ICAO to carry out a Special Implementation Project (SIP) with the primary objective to improve implementation of SIGMET procedures, especially for VA. b) State to take urgent actions to implement the SIGMET procedures.	a) State's Met authorities b) ICAO to implement the SIP. c) ICAO Regional Office to co-ordinate and monitor. <i>Note: ICAO SIP carried out in 2003; progress in issuance of SIGMET for VA is noted; the outstanding problems to be resolved within 1-year time</i> <i>Progress reported by VAAC Darwin</i> LOA between ATO, PHIVOCS & PAGASA signed in 2004 to make reporting part of information dissemination practice. LOA is undergoing periodic review (ref. letter of PAGASA dated March 12, 2008). Darwin VAAC trained forecasters in PNG and Philippines to prepare VA SIGMETs	To be advised	U

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
a) Service for operators and flight crew members. (Annex 3, Chapter 9). b) WAFS products for flight documentation. (ASIA/PAC FASID Table MET 1A).	Cambodia Myanmar	Briefing and flight documentation not provided as required. WAFS products not available	1999	Airlines do not receive the required flight documentation including WAFS forecasts.	States to consider urgent action for installation of SADIS VSAT for receiving WAFS products and OPMET information. Action plan proposed by ICAO MET mission 2003	State's MET authorities <i>A TC project proposal submitted to SSCA, Cambodia</i> Myanmar SADIS FTP approved in 2008, needs to acquire hardware associated with SADIS FTP – Myanmar plans to provide the Regional Office a copy of flight briefing that includes subset of WAFS forecasts as verification of WAFS acquisition Cambodia will investigate SADIS FTP acquisition	Dec 2009 2009/2010	A
MWO for Phnom Penh FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC FASID Table MET 1B)	Cambodia	Requirements for meteorological watch office (MWO) to be established at Phnom-Penh international airport have not been met.		MWO not established due to lack of trained personnel and technical facilities. No SIGMET service for Phnom Penh FIR	Establishment of MWO currently not feasible. Urgent need for bi-lateral agreement for SIGMET service by a neighboring State.	SSCA, Cambodia <i>A TC project proposal submitted to SSCA, Cambodia</i>	TBD	U

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
Provision of SIGMET information (Annex 3, Chapter 7; ASIA/PAC FASID Table MET 1B)	Lao PDR Myanmar Nepal	Requirements for issuance and dissemination of SIGMET have not been fully implemented.	2000	SIGMET frequently not available Reported by airlines	State's MET authority to take urgent actions to implement the SIGMET procedures. ICAO issued new version of ASIA/PAC Regional SIGMET Guide in September 2003 <i>Note: ICAO Regional Office to enquire action plans with fixed target dates from the listed States</i>	State's MET authorities Lao PDR expects to issue SIGMET the end of 2009 Myanmar issues SIGMET and verification process will ensue after APANPIRG/20 to include monitoring by airlines and official notification of SIGMET issuance by State	Dec 2009 Lao PDR Dec 2009 Myanmar	U
MWO for Pyongyang FIR and SIGMET (Annex 3, Chapter 3 & 7; ASIA/PAC FASID Table MET 1B)	DPR Korea	Requirements for meteorological watch office (MWO) to be established at Pyongyang international airport have not been met.	2008	MWO not established due to lack of trained personnel and lack of resources. No SIGMET service for Pyongyang FIR Reported by RO mission	Aerodrome MET Office in place can also serve as MWO in future. ATMB/GACA Immediate consideration of action plan – establish MWO and provide required regular MET service for Pyongyang FIR.	General Administration of Civil Aviation (GACA) DPR Korea MWO established in February 2009 as reported by State. It is necessary to send SIGMET to RODBs in Region for access by the users. Verification of reception will allow for removal of deficiency.	Est. of MWO Feb 2009 Awaiting verification of SIGMET at monitoring RODB	U

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
Volcanic ash information not sent to ATS, MWO and VAAC as per requirements (Annex 3, 3.6 and 4.8)	Kingdom of Tonga	Information on volcanic activity not provided regularly to ATS units, MWOs, and VAAC	2008 TCB CAEMSA- SP report		Monitoring of volcanoes needed as well as communication coordination to ATS, MWO and VAAC	State, Aviation and MET Authorities	TBD	U
WAFS forecasts for pre-flight briefing as per requirements (Annex 3, Chapter 9, Appendix 2 and Appendix 8)	Kiribati Nauru Solomon Islands	Briefing and flight documentation not provided as required. WAFS forecasts not available	2008 TCB CAEMSA- SP report		States to consider urgent action for installation of ISCS for receiving WAFS forecasts and OPMET information.	State's MET authorities (if not declared, the State) If a reliable Internet service is available, ISCS WAFS Internet File Server (WIFS) plans to be available in March 2010. The State still assumes the cost of hardware and software necessary to retrieve the WAFS forecasts and OPMET information.	March 2010	U

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REPORTING FORM ON AIR NAVIGATION DEFICIENCIES IN THE MET FIELD IN THE ASIA/PAC REGION								
Identification		Deficiencies			Corrective action			
Requirements	States/ facilities	Description	Date first reported	Remarks	Description	Executing body	Target date for completion	Priority for action *
Meteorological observations and reports. (Annex 3, Chapter 4)	Nauru	No METAR/SPECI observing program is in place, which also prohibits TAF generation, monitoring and amending.	2008 TCB CAEMSA- SP report	There is a basic need for wind, temperature, dewpoint, visibility and cloud base observations.	Equipment to be upgraded and arrangements to be made for regular observations and long- term maintenance of equipment TC expert recommendation to replace and/or calibrate MET obs. equipment AUUU	State (until MET Authority has been declared) State made aware of MET Services gaps identified by ICAO TC Project, CAEMSA-SP, in late 2008	2010	U

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Summary of MET Gaps in South Pacific
 (Source: TCB - CAEMSA-SP draft reports)

State	Gap	State action proposed	Target date
Cook Islands	MET Obs. Instr. – NCRG (night)	Install AWOS – supply tower	2010
	no LOA - MET & CAA	Negotiate agreement	2009
	no MOU -TAF – Fiji & Cook Is.	Formulate agreement	2009
	no MET authority assigned	Request government designation	2009
	Unreliable MET data outer Is.	Improve comms, maint, monitor	2010
	Unawareness of Ann 3 changes	Improve info w/ ICAO	2009
	no QMS	Utilize knowledge in Fiji	2009
	Lack of wind shear warnings	Improve forecasts through study	2010
	Lack of QMS auditor	CIMS to train auditor	2009
	Transmission of MET inconsist.	Team w/ NZ CAA to use VSAT	2009
Fiji	Cost recovery out of date	Develop accurate cost model	2009
	no LOA – MET & CAA	Develop LOA after cost model	2009
	QMS not complete	Continue QMS development/ISO	2010/2012
	no bilat agr for TAF service	Develop MOUs after regional cost model	2010
	no delegation of MET oversight	Continue to develop	2011
	Add wind sensors TDZ NFNS	Continue current efforts	2009
	Auto AIREP data – needs dissem	Improve dissem of auto AIREP	2009
	Segments of MET service disaster plan lacking	Develop Suva and/or develop MOU with other State(s)	2010
	Lack of NCRG TAF monitoring	Coord w/ CI in montrg (night – cloud and wind shear)	2010
	Ann 3 / WMO changes insufficiently disseminated	Improve procedure to diss. MET standard changes	2009
Kiribati	MET Obs. Instr. NGTA, PLCH (deficiency AP-MET-02)	Purchase/install AWOS	2009/2010
	no MET authority assigned	Continue declaration process	2010
	no MOU – MET support Fiji	Negotiate agreement	2009
	no QMS	Execute KMS strategic plan/ISO	2011/2013
	Need for trained staff for TAF	Develop trng sched and needs to provide to WMO for funds/trng	2009/2013
	no LOA – MET & CAA	Develop LOA	2009
	Tx of MET inconsistent	Explore NZ CAA for VSAT	2010
	Collection/tx of MET info insuf.	Train flight service staff in obs. & monitor procedures	2009
	Current ICAO/WMO docs not avail	Ensure procedures provide info of changes to necessary parties	2009
	Tsunami not in disaster plan	Develop procedures for Tsunami warnings to aviation users	2009
	WAFS forecasts not avail		
Nauru	no MET authority assigned	Rewrite Nauru Civil Aviation	2009

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State	Gap	State action proposed	Target date
		Act	
	no MOU – TAF/SIGMET PNG	Negotiate agreement	2009
	no MET authority assigned	Develop designation	2009
	Current ICAO/WMO docs not avail	Ensure current docs are obtained	2009
	Lack of temperature/dewpoint at aerodrome	NOTAM no temp or dewpnt or NOTAM temp/dewpnt measured 2 km away	Immediate
	no MET observations (short term)	Repair equipment via tech support by Airways NZ	2009
	no MET observations (long term)	Install automated weather observing system at AUUU	2011-2012
	Staff not to WMO standards	Train FIC staff to WMO stds via trainers in Solomon Islands	2009
	METAR not provided	Re-establish METAR prgm	2009/10
	Comms unreliable	Implement VSAT via Airways NZ	2009/10
	no QMS for METAR	Establish QMS for METAR	2009/10
	no QMS for CAA	Establish QMS/ISO for CAA	2011/13
	WAFS forecasts not avail		
Samoa	no QMS implementation	Develop QMS/ISO	Dec 2010
	No oversight of SMD	Liaise with PASO for oversight Certify SMD	2010 2011
	No anemometer output and limited communications avail for MET data access by users	NZ Airways Corporation install displays for wind info Upgrade MET facilities at Faleolo Intl	2009 2010
	No cloud base or visibility sensors at Faleolo	Installation of AWS with cloud ceiling and visibility sensors	2010
	Forecasters (NSMA) not compliant with WMO qualifications	Investigate options with WMO	2009
	No formal agreement for the provision of TAF from Fiji	Develop bi-lateral agreement on the provision of TAF	2010
	No agreement of MET services for CAA	Develop LOA between MET and CAA	2009
Solomon Is.	AGGH METAR does not comply to ROBEX	Update ROBEX HB (RO)	2009
	TAF not accurate and timely	Establish aviation frctng unit at AGGH	2009
	no calibrated MET obs (wind, vis, cloud) AGGH (deficiency AP-MET-01)	Replace and/or calibrate MET obs. equipment AGGH	2008/2009
	MET enclosure poor at AGGH	Develop MET enclosure at AGGH	2008
	METAR avail inconsist	Improve avail of METAR and monitoring	2008
	no QMS for METAR	Develop QMS for METAR	2009

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State	Gap	State action proposed	Target date
	Tx of METAR not in accord to ROBEX HB	Tx METAR w/i 5 min of report time to Brisbane	Immediate
	ICAO/WMO docs not current	Obtain updated ICAO/WMO docs	2009
	no formal oversight	Confirm oversight	2009
	no LOA between MET & CAA	Develop LOA MET & CAA	2009
	Need planning for METAR/TAF avail at altern AGGM	Include AGGM in SANG31 and FTNG31 bulletins	As required
	no QMS implementation	Develop QMS/ISO	2010/2013
	WAFS forecasts not avail	Procure ISCS	2010
	Comms unreliable	Implement VSAT via Airways NZ	2009
	Gaps in disaster plan for provision of MET service	Improve disaster plan via MOU w/ other MET service	2009
	Changes to Annex 3 not communicated	Disseminate Annex 3 changes to appropriate parties	2009
Tonga	no MET auth and oversight designation	TCA define MET auth and oversight	2009
	AIP needs to reflect MET auth	Include MET auth in AIP	2009
	no cost recovery model	Develop cost recovery model	2010
	no LOA between MET & CAA	Develop LOA MET & CAA	2010
	no QMS established	Develop QMS	2011
	no bilat for TAF w/ Fiji	Develop bilat for TAF from Fiji	2009
	no post disaster recovery for provision of MET in disast plan	Include post disaster recovery for MET in disast plan	2009
	Pilot briefings sometimes outdated	Links to NWS should be deleted if not information not timely	2009
	Met obs not optimal (vis, cloud especially at night)	Upgrade obs equipment and optimize locations	2009-10
	Action items from APAC MET SIP not current	Revise action items from SIP	2009
	Lack of monitoring of active volcanoes		
Vanuatu	no QMS established	Develop QMS	2011-2013
	No oversight designation	CAAV, VMS, and PASO determine oversight designation	2013
	Updated WMO training requirements reduces available forecasters	VMS to express desire of pre-2003 Class II MET at WMO RA-V meeting	2009
	Lack of automated measurements of cloud heights and visibility	Upgrade or maintain the current equipment with consideration for common sensor types in the region for ease of service contracts	2010
	No LOA between MET Auth and CAA	Develop LOA between MET Auth and CAA with regards MET services provided to ATS	2010
	No cost recovery for MET	Investigate cost recovery system	2010

APANPIRG/20
Appendix E to Agenda Item 4

State	Gap	State action proposed	Target date
	services in support of international aviation		
	no MOU on provision of SIGMET – Fiji on behalf of Vanuatu	Formulate agreement (or verify agreement for the FIR management)	2010
	Monitoring and reporting of volcanic activity needs improvement	CAAV investigates monitoring and reporting procedures of volcanic activity	2009

**Proposed list of APANPIRG Air Navigation Deficiencies as a result
of the ICAO TCB CAEMSA-SP**

COOK ISLANDS:

- NIL

FIJI:

- NIL

KINGDOM OF TONGA

- Lack of monitoring of active volcanoes – non-compliance with IAVW provisions. Reference Annex 3, 3.6 and 4.8 (*Note that Annex 3, 3.6 does not say that it needs to establish a state volcanic observatory – only that the information be provided to ATS, etc..*)

KIRIBATI

- Lack of WAFS products needed for pre-flight briefing. Annex 3, Chapter 9 and Appendix 2, 2.1 and Appendix 8.

NAURU:

- MET Observations at Nauru International – AUUU: No METAR/SPECI observing program is in place. TAF issuance monitoring and amending not supported by an observing program. Reference Annex 3, 4.3.1 and no calibrated and maintained equipment available for measuring wind speed and direction; no calibrated and maintained equipment available for the measurement of temperature and dew point; lack of automatic instruments to support accurate visibility and cloud base observations. Reference Annex 3, 4.5, 4.6 and Appendix 3 Section 4
- Lack of WAFS products needed for pre-flight planning. Reference Annex 3, Chapter 9 and Appendix 2, 2.1 and Appendix 8.

SOLOMON ISLANDS:

- Lack of WAFS products needed for pre-flight briefing. Annex 3, Chapter 9 and Appendix 2, 2.1 and Appendix 8.

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AGENDA ITEM 5: FUTURE WORK PROGRAMME

Agenda Item 5: Future Work Programme

Schedule of Future meetings

5.1 The meeting agreed that the tentative schedule of meetings for the rest of 2009, 2010 and 2011 should be as follows (Notes: A decode of acronyms has been included in **Appendix A** to the Report on Agenda Item 5):

2009 – outstanding meetings		
ATFM/TF/13	22-25 Sep	Bangkok
ATNICG WG/6	22-25Sep	Hua Hin
FPL & AM TF/2 & Seminar	17-20 Nov	Bangkok
BOB-RHS/TF/1	2-6 Nov	Bangkok
MET/ATM TF/1	2-4 Dec	Bangkok
Regional preparatory Group – WRC-2011	8-9 Dec	Bangkok
SEA RR/TF/1	8-11 Dec	Bangkok
RASMAG/12	14-18 Dec	Bangkok
2010		
BBACG/21& ASIOACG/5	1-5 Feb	Bangkok
OPMET/M TF/8	23-25 Mar	Tokyo
PBN Seminar	1-2 Feb	Hong Kong
PBN TF	3-5 Feb	Hong Kong
ADS-B Regulatory Workshop	Apr	Bangkok
ADS-B SITF/9	Apr	TBD
FPL & AM TF/3	Apr	Bangkok
ATN IC G/5	May	TBD
RASMAG/13	May	Bangkok
SEACG/17 & FIT-SEA/10	May	Bangkok
PBN TF	May/June	Bangkok
ATM/AIS/SAR/SG/20	21-25 June	Bangkok
CNS/MET SG/14	19-23 July	Bangkok
APANPIRG/21	6 – 10 Sep	Bangkok
Global AIM congress & AAITF5	Sep	Beijing
RASMAG/14	Dec.	Bangkok
2011		
BBACG/22 & FIT-BOB/12	Jan	Bangkok
OPMET/M TF/9	Mar	Bangkok
SEACG/18 & FIT-SEA/11	April	Bangkok
ADS-B SITF/10	April	TBD
AAITF/6	May	Tokyo
ATN IC G/6	May	TBD
ATM/AIS/SAR/SG/21	Jun	Bangkok
CNS/MET SG/15	July	Bangkok
APANPIRG/22	5-9 September	Bangkok

5.2 The meeting noted that the provisional agenda for APANPIRG/20 was prepared in line with Air Navigation Commission's proposal for a uniform approach to formulation of agenda for the PIRGs meetings. The provisional agenda for future APANPIRG meetings will be in this format.

Coordination meeting between Chairmen of Sub-Groups

5.3 The Chairmen of the APANPIRG Sub-Groups reported that they had met prior to APANPIRG and co-ordinate the activities of the Sub-groups. No issue was separately identified that need to be raised to APANPIRG with the matters common between the Subgroups adequately being dealt with through the reports already prepared for the meeting.

5.4 The Chairmen reviewed the list of contributing bodies to APANPIRG and will update the list accordingly.

5.5 The meeting noted the consensus amongst the chairperson/vice-chairpersons that the establishment of additional contributory bodies should be on a need basis to guard against further stretching the limited resources available. Consideration should be given to adjust the scope of the terms of reference of the existing bodies instead of creating additional bodies to do the job. APANPIRG conveyed the appreciation of the work done by the Chairperson of the various sub groups.

Proposal on Future ATM System by Japan

5.6 The meeting noted Japan's proposal to position APANPIRG as a new platform to discuss the future ATM system of the Asia and Pacific Region and establish a new subgroup or a dedicated project under APANPIRG.

5.7 Although the meeting appreciated the initiative, but highlighted number of issues that need to be considered before taking any further consideration. The issues include inter alia: regional planning mechanism is established to address only short and medium term requirements as specified in the Global Plan; the ICAO Air navigation Commission with the assistance of the Secretariat is already addressing future ATM systems through number of Panels and Study Groups; the terms of reference of APANPIRG does not include addressing future ATM systems as it is currently relates to only Global Plan; results in duplication of efforts; and calls for additional expertise and resources for APANPIRG.

5.8 Japan noted that the current CNS/ATM concept, then FANS concept adopted at the ICAO ANC/10 in 1991 has its implementation target for 2010 and considered that it is necessary for the Asia/Pacific Regions to start preparatory works for harmonious implementation of future ATM system, which shall be in line with the Global ATM operational concept targeted in 2025.

5.9 Consequently, the meeting agreed to defer the paper under discussion and requested Japan to raise the matter in the first instance at the forthcoming 46th DGCA conference with details such draft terms of reference of new subgroup, membership, expertise required, scope and timelines etc.

APPENDIX - A
ACRONYMS

ATFM	Air Traffic Flow Management
WPAC/SCS RSG	Western Pacific/South China Sea RVSM scrutiny working Group
SAREX	Search and Rescue Exercise
RNP-SEA/TF	South East Asia RNP Implementation Task Force
D-FIS	Data Link Flight Information Service
RVSM/TF	Reduced Vertical Separation Minima Implementation Task Force
RASMAG	Regional Air Space Monitoring Advisory Group of APANPIRG
BBACG	Bay of Bengal ATS coordination Group
FIT-BOB	FANS 1/A Implementation Team, Bay of Bengal
AIS	Aeronautical Information Services
TRASAS	Trans-Regional Airspace and supporting ATM systems Steering Group
OPMET/M TF	Operational Meteorological Management Task Force.
ADS-B SITF/8	ADS-B Study and Implementation Task Force
ATN IC G/4	Aeronautical Telecommunication Network Implementation and Coordination Group
SEACG	South East Asia ATS coordination Group
FIT-SEA	FANS 1/A Implementation Team, South East Asia
ATM/AIS/SAR/SG	ATM/AIS/SAR Sub-Group of APANPIRG
CNS/MET SG	CNS/MET Sub- Group of APANPIRG
APANPIRG	Asia/Pacific Air Navigation Planning and Implementation Group
AAITF	Aeronautical Information Services – Aeronautical Information Management Implementation Task Force
FPL & AM/TF	ICAO Flight Plan and ATS Messages Task Force

AGENDA ITEM 6: ANY OTHER BUSINESS

Agenda Item 6: Any other business

6.1 The meeting recalled that consequent to the Council decision of March 2008, the APANPIRG membership has been expanded to include all the 38 States in the Asia and Pacific Regions including Afghanistan accredited to the region in 2009. The meeting supported and approved the terms of reference for the Chairperson, first vice chairperson and second vice chairperson as proposed.

**TERMS OF REFERENCE FOR CHAIRPERSON/FIRST VICE CHAIRPERSON/
SECOND VICE CHAIRPERSON APANPIRG**

- The Chairperson/First Vice Chairperson/Second Vice Chairperson shall be a serving official of their State Administration, holding position of progressive responsibilities. He/She should have vast experience in the administration and management related to international civil aviation matters.
- The term of the Chairperson, First Vice Chairperson and Second Vice Chairperson shall be for a maximum period of three years. If an elected Chairperson is due for retirement or resigns from his organization during this period, the Group may elect a new Chairperson.

6.2 The meeting supported a new administration for the conduct of APANPIRG meeting and agreed to take up election of officers as the first item of Agenda for APANPIRG/21.

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Attachment 1 to the APANPIRG/20 Report
List of Participants

LIST OF PARTICIPANTS

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
1.	AUSTRALIA (2)			
	1.	Mr. Ian Mallett	Section Head Aerodromes and CNS/ATM Civil Aviation Safety Authority	Tel: +61 (2) 6217 1736 Fax: +61 (2) 6217 1500 ian.mallett@casa.gov.au
	2.	Ms. Sue J Keey	Manager Operations Support Airservices Australia GPO Box 367 Canberra ACT 2601	Tel: +61 (2) 6268 4249 Fax: +61 (2) 6268 4848 sue.keey@airservicesaustralia.com
2.	BANGLADESH (3)			
	3.	Mr. Azad Zahirul Islam	Deputy Director Air Transport Civil Aviation Authority	Tel: +880 (2) 891 4870; 891 4635 Fax: +880 (2) 891 3322 ncusapcaab@yahoo.com
	4.	Mr. Abdul Alim	Deputy Director Communications Civil Aviation Authority	Tel: +880 (2) 791 1298 (R) Fax: +880 (2) 891 3322
	5.	Ms. Shirin Sultana	Senior Aerodrome Officer Civil Aviation Authority	Tel: +880 (2) 891 4870/3592 (O) Fax: +880 (2) 891 3322 dfarcaab@accesstel.net
3.	BRUNEI DARUSSALAM (2)			
	6.	Mr. Mohd. Tahir B Metali	Air Traffic Control Officer Civil Aviation Department, Ministry of Communications Brunei International Airport Bandar Seri Begawan, BB2513	Tel: +673 (2) 330 142 ext. 1522 Fax: +673 (2) 345 345 tahir.metali@civil-aviation.gov.bn hirmet269@hotmail.com

Attachment 1 to the APANPIRG/20 Report
List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	7.	Mr. Osman B Haji Damit	Aeronautical Telecommunications Engineer Civil Aviation Department, Ministry of Communications Brunei International Airport Bandar Seri Begawan, BB2513	Tel: +673 (2) 330 142 ext. 1389 Fax: +673 (2) 345 345 osman_damit@civil-aviation.gov.bn osmanhada@gmail.com
4.	CAMBODIA (2)			
	8.	Mr. Sary Peang	Director State Secretariat of Civil Aviation #62, Preah Narodom Blvd., Phnom Penh	Tel: +855 (23) 224 258 (SSCA) Fax: +855 (23) 224 259 Tel: +855 (23) 866 294 (Airport) Fax: +855 (23) 890 214 sary@cats.com.kh
	9.	Mr. Sivorn Chhun	Deputy Director State Secretariat of Civil Aviation #62, Preah Narodom Blvd., Phnom Penh	Tel: +855 (23) 224 258 Fax: +855 (23) 224 259 chhunsivorn@yahoo.com
5.	CHINA (12)			
	10.	Ms. Zhang Jing	Director of International Cooperation Div. ATMB Headquarters, CAAC	Tel: +86 (10) 8778 6051 Fax: +86 (10) 8778 6055 cherry@atmb.net.cn
	11.	Mr. Huang Wei Fang	Assistant of Airspace Division ATMB Headquarters, CAAC	Tel: +86 (10) 8778 6836 Fax: +86 (10) 8778 6830 huang_wei_fang@atmb.net.cn
	12.	Mr. Li Gen Yi	Assistant of CNS Division ATMB Headquarters, CAAC	Tel: +86 (10) 8778 6966 Fax: +86 (10) 8778 6910 ligenyi@atmb.net.cn
	13.	Mr. Colman NG Shung Ching	Assistant Director-General Civil Aviation Department Air Traffic Management Div. 4/F, Air Traffic Control Complex 1 Control Tower Road, HK Int'l Airport Lantau, Hong Kong	Tel: +852 2910 6402 Fax: +852 2910 0186 cscng@cad.gov.hk

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
14.	Mr. Wong Ping Fai	Assistant Director-General (ATM) Civil Aviation Department Air Traffic Management Div. 4/F, Air Traffic Control Complex 1 Control Tower Road, HK Int'l Airport Lantau, Hong Kong	Tel: +852 2910 6402 Fax: +852 2910 0186	pfwong@cad.gov.hk
15.	Mr. Shun Chi Ming	Assistant Director (Aviation Weather Services) Hong Kong Observatory 134A, Nathan Road, Tsim Sha Tsui, Kowloon, Hong Kong	Tel: +852 2926 8223 Fax: +852 2957 8721	cmshun@hko.gov.hk
16.	Mr. Raymond Li Kwok Chu	Chief (Procedures and Evaluation) Civil Aviation Department Air Traffic Management Div. 4/F, Air Traffic Control Complex 1 Control Tower Road, HK Int'l Airport Lantau, Hong Kong Civil Aviation Department	Tel: +852 2910 6438 Fax: +852 2910 0186	rkcli@cad.gov.hk
17.	Mr. Richard Wu Chi Kwong	Senior Electronics Engineer Civil Aviation Department Air Traffic Engineering and Standards Div. 3/F Dragonair House 11 Tung Fai Road HK Int'l Airport	Tel: +852 2591 5029 Fax: +852 2326 3508	rckwu@cad.gov.hk
18.	Mr. Au Yeung Hung Leung	Air Traffic Control Officer II Civil Aviation Department Air Traffic Management Div. 4/F, Air Traffic Control Complex 1 Control Tower Road, HK Int'l Airport Lantau, Hong Kong	Tel: +852 2910 6808 Fax: +852 2910 0186	thlauyeung@cad.gov.hk

Attachment 1 to the APANPIRG/20 Report
List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
19.	Mr. Pun Wa Kin	Acting Director – Flight Standards & Licensing Macao, China Civil Aviation Authority Alameda Dr. Carlos D’Assumpcao, 336-342 Centro Comercial Cheng Feng, 18 andar Macao	Tel: +853 8796 4109 Fax: +853 2833 8089	stanleypun@aacm.gov.mo
20.	Mr. Chiu Kuan Hou	Safety Officer Macao, China Civil Aviation Authority Alameda Dr. Carlos D’Assumpcao, 336-342 Centro Comercial Cheng Feng, 18 andar Macao	Tel: +853 8796 4142 Fax: +853 2833 8089	bryanchiu@aacm.gov.mo
21.	Mr. Lam Tat Ming	Senior Safety Officer Civil Aviation Authority of Macao, China Alameda Dr. Carlos D’Assumpcao, 336-342 Centro Comercial Cheng Feng, 18 andar Macao	Tel: +853 87964120 Fax: +853 2833 8089	taftlam@aacm.gov.mo
6.	FIJI ISLANDS (3)			
22.	Mr. Isei T. Tudreu	Controller Ground Safety Civil Aviation Authority of the Fiji Islands CAAFI Private Mail Bag, NAP 0354 Nadi International Airport	Tel: +679 672 1555 Fax: +679 672 1500	cgs@caaf.org.fj iseitudreu@hotmail.com
23.	Mr. Moagrava T Elaisa	Manger Telecommunications Services Airports Fiji Limited Private Mail Bag Nadi International Airport	Tel: +679 673 1160 Fax: +679 673 1123	moagrava@afl.com.fj mts@afl.com.fj
24.	Mr. Vula C. Seru	Manager ATM Airports Fiji Limited Private Mail Bag Nadi International Airport	Tel: +679 673 1514; 673 1435 Fax: +679 675 4600	vulas@afl.com.fj

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
7.	FRANCE (2)			
	25.	Mr. Vivian Elise	Head of ANS SEAC PF (French Civil Aviation) Service Navigation Aérienne PO Box 6011 - 98702 FAAA French Polynesia	Tel: +689 861 020 Fax: +689 861 239 vivian.elise@seac.pf sna-pf@seac.pf
	26.	Mr. Fabrice Tussau	ATM Consulting and Engineering ATM Export Manager egisavia 4 bis rue Paul Mesple – BP 20603 31106 Toulouse Cedex 1 France	Tel: +33 5 62 245 606 Fax: +33 5 62 244 964 fabrice.tussau@egis.fr
8.	INDIA (3)			
	27.	Mr. Praveen Seth	Member (Operations) Airports Authority of India Rajiv Gandhi Bhawan, Safdarjung Airport New Delhi – 1100034	Tel: +91 (11) 2463 1969 Fax: +91 (11) 2462 9567 memberops@aai.aero
	28.	Mr. Somasundaram V	Executive Director (ATM) Airports Authority of India Rajiv Gandhi Bhawan, Safdarjung Airport New Delhi – 1100034	Tel: +91 (11) 2465 2648 Fax: +91 (11) 2465 4969 edatmvs@aai.aero somu1955@hotmail.com
	29.	Mr. Vinod Kumar Chaudhary	Executive Director (CNS-PLG) Airports Authority of India Rajiv Gandhi Bhawan, Safdarjung Airport New Delhi – 1100034	Tel: +91 (11) 2461 8279 Fax: +91 (11) 2461 1134 edcnsppchqnad@aai.aero vk_50@rediffmail.com
9.	INDONESIA (2)			
	30.	Mr. Wisnu Darjono	Deputy Director of ATM Directorate General of Civil Aviation Jl. Merdeka Barat No. 8 Jakarta 10110	Tel: +62 (21) wdu@indosat.net.id

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NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	31.	Mr. Moh. Hasan Bashory	Chief of Standardization of Air Navigation Directorate General of Civil Aviation Jl. Merdeka Barat No. 8, Jakarta 10110	Tel: +62 (21) 350 5550 ext. 5162 Fax: +62 (21) 350 7569 bashory@aviasi.org
10.	JAPAN (6)			
	32.	Mr. Hideki Sugai	Director, Office of Air Traffic International Policy and Programs 2-1-3, Kasumigaseki, Chiyoda-ku Tokyo 100-8918	Tel: +81 (3) 5253 8740 Fax: +81 (3) 5253 1663 sugai-h2ae@mlit.go.jp
	33.	Mr. Takahiro Morishima	Special Assistant to the Director Office of Air Traffic International Policy and Programs 2-1-3, Kasumigaseki, Chiyoda-ku Tokyo 100-8918	Tel: +81 (3) 5253 8740 Fax: +81 (3) 5253 1663 morishima-t2zg@mlit.go.jp
	34.	Mr. Takafumi Nakada	Deputy Director, ATS Engineering Division ATS Department, Civil Aviation Bureau Ministry of Land, Infrastructure, Transport and Tourism 2-1-3, Kasumigaseki, Chiyoda-ku Tokyo 100-8918	Tel: +81 (3) 5253 8111 ext. 51-403 Fax: +81 (3) 5253 1663 nakada-t2q4@mlit.go.jp
	35.	Mr. Satoshi Ishida	Special Assistant to the Director Aviation Safety and Security Promotion Div. Ministry of Land, Infrastructure, Transport and Tourism 2-1-3, Kasumigaseki, Chiyoda-ku Tokyo 100-8918	Tel: +81 (3) 5253 8696 Fax: +81 (3) 3580 5233 ishida-s259@mlit.go.jp
	36.	Mr. Hiroshi Inoguchi	Air Talks Officer, International Air Transport Division Ministry of Land, Infrastructure, Transport and Tourism 2-1-3 Kasumigaseki, Chiyoda-ku Tokyo 100-8918	Tel: +81 (3) 5253 8703 Fax: +81 (3) 3580 1656 inoguchi-h2hh@mlit.go.jp

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	37.	Mr. Kensuke Kobayashi First Secretary Embassy of Japan in Thailand 177 Witthayu Road, Lumpini Pathum wan, Bangkok 10330	Tel: +66 (2) 207 8500 Fax: +66 (2) 207 8517	kensuke.kobayashi@ej.or.th
11.	LAO PDR (4)			
	38.	Mr. Bountaeng Symoon Director of Air Navigation Lao DCA Wattay International Airport P.O. Box 119, Vientiane	Tel: +856 (21) 512 163-4 Fax: +856 (21) 520 237	bountaeng@yahoo.com
	39.	Mr. Khamvanh Mala Director of Aeronautical Division of Lao PDR Civil Aviation Department Wattay International Airport P.O. Box 119, Vientiane	Tel: +856 (21) 512 163 Fax: +856 (21) 520 237	malakhamvanh@yahoo.com
	40.	Mr. Somchit Vinithkeophanvanh General Director Lao Air Traffic Management P.O. Box 2985, Vientiane Capital	Tel: +856 (21) 513 036 Fax: +856 (21) 512 216	laoats@yahoo.com
	41.	Mr. Manasavanh Kounlath Deputy Director Air Traffic Services Centre Lao Air Traffic Management P.O. Box 2985, Vientiane Capital	Tel: +856 (21) 512 006 ext. 207 Fax: +856 (21) 512 216	manas998@yahoo.com kounlath2005@yahoo.com
12.	MALAYSIA (4)			
	42.	Mr. Azharuddin Abd. Rahman Director General of Civil Aviation, Malaysia Department Civil Aviation No. 27, Persiaran Perdana Level 3, Podium Block B, Precinct 4 62618 Putrajaya	Tel: +60 (3) 8871 4217 Fax: +60 (3) 8889 5691	azhar@dca.gov.my

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	43.	Mr. Ahmad Nizar Zolfakar	Director Air Traffic Management Sector Department Civil Aviation No. 27, Persiaran Perdana Level 4, Podium Block B, Precinct 4 62618 Putrajaya	Tel: +60 (3) 8871 4227 Fax: +60 (3) 8881 0510 ahmad_nizar@dca.gov.my
	44.	Mr. Jamil Khir Mohamed	Deputy Director Air Traffic Management Sector Department Civil Aviation No. 27, Persiaran Perdana Level 4, Podium Block B, Precinct 4 62618 Putrajaya	Tel: +60 (3) 8871 4228 Fax: +60 (3) 8881 0530 jamilkhir@dca.gov.my
	45.	Mr. Harizan Mohd. Yatim	CNS/ATM Consultant Selex Sistemi Integrati (System Supplier/Maintenance Contractor for DCA Level 61, Tower 2, Petronas Twin Towers Kuala Lumpur City Centre 50088	Tel: +60 (8) 2382 2400 Fax: +60 (3) 2382 0477 harizanyatim@yahoo.com harizan@selex-si.com.my
13.	MALDIVES (2)			
	46.	Mr. Moosa Solih	Chief Operating Officer Maldives Airports Company Limited Male International Airport Hulhule	Tel: +960 333 8800 Fax: +960 331 7033 moosasolih@maclnet.net
	47.	Mr. Ibrahim Thoha	General Manager – Air Traffic Services Maldives Airports Company Limited Male International Airport Hulhule	Tel: +960 333 1711 Fax: +960 330 9905 thoha@maclnet.net
14.	MONGOLIA (6)			
	48.	Mr. G. Enebish	Civil Aviation Authority of Mongolia Chinggis Khaan International Airport Ulaanbaatar – 1712 Mongolia	Tel: +976 (11) 282 041 Fax: +976 (11) 379 981 g_enebish@mcaa.gov.mn

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
49.	Mr. Bat Gurdorj	Officer in charge of Civil Aviation, Road and Transport Department, Ministry of Road, Transportation, Construction and Urban Development of Mongolia 15170 Barilagachdiin talbai 3 Chingeltei duureg, Ulaanbaatar	Tel: +976 (11) 310 612 Fax: +976 (11) 322 904	bat@mcaa.gov.mn bat_gurdorjiin@yahoo.com
50.	Mr. Buyandalai Sengee	Air Space Management Specialist Civil Aviation Authority of Mongolia Chinggis Khaan International Airport Ulaanbaatar – 17120	Tel: +976 (11) 282 021 Fax: +976 (11) 379 981	buyandalai@mcaa.gov.mn
51.	Mrs. Ariungerel Purev	Director of Aeronautical Information Services Civil Aviation Authority of Mongolia PO. B-59, Ulaanbaatar – 34 Mongolia 2110134	Tel: +976 (11) 283 131 Fax: +976 (11) 313 157	ariungerel@mcaa.gov.mn arngrl@yahoo.com
52.	Mr. Maasuren Dagva	Meteorology Inspector Civil Aviation Authority of Mongolia Chinggis Khaan International Airport Ulaanbaatar – 17120	Tel: +976 (11) 285 048 Fax: +976 (11) 379 640	maasuren@mcaa.gov.mn
53.	Mr. Batkhaan Dorjnyam	Manager of Aeronautical Rescue Coordination Center Civil Aviation Authority of Mongolia Chinggis Khaan International Airport Ulaanbaatar – 17120	Tel: +976 (11) 281 622; 281 691 Fax: +976 (11) 281 154	batkhaan@mcaa.gov.mn ub_rcc@mcaa.gov.mn
15.	MYANMAR (2)			
54.	Mr. Nyunt Win	Assistant Director (ATS/AIS) Department of Civil Aviation ATC Operations Building Yangon International Airport Yangon 11021	Tel: +95 (1) 533 085 Fax: +95 (1) 533016, 533041	aiso@ais.gov.mm ais.myanmar@gmail.com

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	55.	Mr. Thura San	Air Traffic Control Officer Department of Civil Aviation ATC Operations Building Yangon International Airport Yangon 11021	Tel: +95 (1) 533 008 Fax: +95 (1) 533016, 533041 ats@dca.gov.mm
16.	NEPAL (4)			
	56.	Mr. Ratish Chandra Lal Suman	Deputy Director General Civil Aviation Authority of Nepal Babar Mahal Kathmandu	Tel: +977 (1) 426 2532 Fax: +977 (1) 426 2516 ratishsuman@yahoo.com cnsatm@mos.com.np
	57.	Mr. Sanjiv Gautam	Director, Air Traffic Management Civil Aviation Authority of Nepal Babar Mahal Kathmandu	Tel: +977 (1) 426 6139 Fax: +977 (1) 426 2516 gautam_sanjiv@hotmail.com atsdr@caanepal.org.np
	58.	Mr. Mahendra Singh Rawal	Director, CNS Department Civil Aviation Authority of Nepal Babar Mahal Kathmandu	Tel: +977 (1) 426 2387 Fax: +977 (1) 426 2516 mrawal@wlink.com.np
	59.	Ms. Geeta Shrestha	Manager, ATC Training and Rating Division Tribhuvan International Airport Civil Aviation Office Gauther, Kathmandu	Tel: +977 (1) 411 3014 Fax: +977 (1) cnsatm@mos.com.np geetasts@live.com
17.	NEW ZEALAND (1)			
	60.	Mr. Mike Haines	Manager Aeronautical Services Civil Aviation Authority of New Zealand PO Box 31441, Lower Hutt 5040	Tel: +64 (4) 560 9429 Fax: +64 (4) 569 2024 hainesm@caa.govt.nz
18.	PAKISTAN (3)			
	61.	Mr. Yousuf Abbas Syed	Director Operations Pakistan Civil Aviation Authority Headquarters Jinnah International Airport, Terminal 1, Karachi 75200	Tel: +92 (21) 9924 2742 Fax: +92 (21) 3460 4323 dops@caapakistan.com.pk

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	62.	Mr. Tariq Mahmood Gill	Chief Operations Officer Pakistan Civil Aviation Authority Jinnah International Airport, Terminal 1, Karachi 75200	Tel: +92 (21) 924 8173 Fax: +92 (21) 924 8210 tariqmgill@gmail.com
	63.	Mr. Aslam Muhammad	Corporate Manager Communication Operations Pakistan Civil Aviation Authority Headquarters Jinnah International Airport, Terminal 1 Karachi 75200	Tel: +92 (21) 924 8775 Fax: +92 (21) 924 2131 aftmophq@caapakistan.com.pk Muhammad.aslam@caapakistan.com.pk
19.	PHILIPPINES (1)			
	64.	Engr. Andrew B. Basallote	Director, Air Navigation Service Civil Aviation Authority of the Philippines CAAP Compound Old MIA Road Corner Ninoy Aquino Ave. Pasay City, Metro Manila 1301	Tel: +63 (2) 879 9163 Fax: +63 (2) 879 9165 andybasallote@yahoo.com abasallote@hotmail.com
20.	REPUBLIC OF KOREA (7)			
	65.	Mr. Kang Chang Jin	Director Aviation Safety Div. Office of Civil Aviation, Ministry of Land, Transport and Maritime Affairs 1-8, Byeoryang-dong, Gwacheon-51 Gyeonggi-do 427800	Tel: +82 (2) 2669 6432 Fax: +82 (2) 2662 5213 acckang@mltm.go.kr acckang@korea.kr
	66.	Mr. Ha Huho	Assistant Director Air Traffic Management Div. Office of Civil Aviation, Ministry of Land, Transport and Maritime Affairs 1-8, Byeoryang-dong, Gwacheon-si, Gyeonggi-do 427800	Tel: +82 (2) 2669 6425 Fax: +82 (2) 6342 7289 hoocho_ha@korea.kr hoocho_ha@yahoo.co.kr

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
67.	Mr. Jung Eui Yong	Assistant Director Air Navigation Facilities Div. Office of Civil Aviation, Ministry of Land, Transport and Maritime Affairs 1-8, Byeolyang-dong, Gwacheon-si, Gyeonggi-do 427800	Tel: +82 (2) 2669 6438 Fax: +82 (2) 2669 7299	radarj@korea.kr jungeuiyong@mltm.go.kr
68.	Mr. Kang Dong Soo	ANS Inspector, Assistant Director Office of Civil Aviation, Ministry of Land, Transport and Maritime Affairs 1-8, Byeolyang-dong, Gwacheoun-si, Gyeonggi-do 429801	Tel: +82 (2) 2669 6404 Fax: +82 (2) 2662 5213	myapril@mltm.go.kr designer@korea.kr
69.	Mr. Lee Man Woo	Technical Manager Korea Airports Corporation 274, Gwahae Dong, Gangseo Gu Seoul	Tel: +82 (2) 2660 2866 Fax: +82 (2) 2660 2320	manoo@airport.co.kr
70.	Mr. Bae Jong Oh	Deputy Director Incheon International Airport Corporation ILS Team, IIAC, 2850 Ansea-dong Jung-gu, Incheon 400 – 700	Tel: +82 (32) 741 2711 Fax: +82 (32) 741 2798	baejh@airport.kr
71.	Mr. Song Jeung Chan	Team Manager Incheon International Airport Corporation 2850 Ansea-dong Jung-gu, Incheon 400 – 700	Tel: +82 (32) 741 5459 Fax: +82 (32) 741 2700	sojech456@hanmail.net
21.	SINGAPORE (7)			
72.	Mr. Wong Woon Liong	Senior Director (Changi Airport Advisory Group) Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6595 6808 Fax: +65 6545 5369	wong.woonliong@changiairport.com

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
73.	Mr. Ng Tee Chiou	Director (Air Traffic Services) Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6541 2407 Fax: +65 6545 6516	ng_tee_chiou@caas.gov.sg
74.	Mr. Kuah Kong Beng	Chief Air Traffic Control Officer Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6541 2405 Fax: +65 6545 6516	kuah_kong_beng@caas.gov.sg
75.	Mr. Edmund Heng	Head (Air Traffic Management) Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6541 2457 Fax: +65 6545 6516	edmund_heng@caas.gov.sg
76.	Mr. Vincent Hwa	Head ANS Policy (International) Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6595 6070 Fax: +65 6545 6516	hwa_teck_pheng@caas.gov.sg
77.	Mr. Yeo Cheng Nam	Deputy Director (Aeronautical Telecommunications & Engineering) Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6541 2442 Fax: +65 6545 6516	yeo_cheng_nam@caas.gov.sg
78.	Mr. Lo Weng Kee	Head (Technical Standards) Civil Aviation Authority of Singapore Singapore Changi Airport PO Box 1 Singapore 918141	Tel: +65 6541 2445 Fax: +65 6542 2447	lo_weng_kee@caas.gov.sg

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NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
22.	SRI LANKA (3)			
	79.	Mr. Atula Jayawickrama Deputy Director Aerodrome & Navigation Services Civil Aviation Authority of Sri Lanka 64, Galle Road Colombo 03	Tel: +94 11 243 6324 Fax: +94 11 244 0231	ddans@caa.lk atulacaa@sltnet.lk
	80.	Mr. Wipula Wimalashanthi Head of Electronics & Air Navigation Engineering Airport and Aviation Services (SL) Limited Bandaranaike International Airport Katunayake	Tel: +94 11 263 3488 Fax: +94 11 263 3488	ceeasl@slt.lk
	81.	Ms. Warnakulasuriya C Tissera Head of Air Navigation Services Airport and Aviation Services (SL) Limited Bandaranaike International Airport Katunayake	Tel: +94 11 225 2062 Fax: +94 11 225 2062	wctissera@yahoo.com
23.	THAILAND (15)			
	82.	Dr. Jaroon Meesomboon Acting Director of Airport Standards Bureau Department of Civil Aviation 71 Soi Ngamduplee, Rama IV Rd., Tungmahamek, Sathorn, Bangkok 10120	Tel: +66 (2) 286 2922 Fax: +66 (2) 286 1013	mjaroon@aviation.go.th
	83.	Mr. Surasit Jitourtrakul Senior Professional Electrical Engineer Department of Civil Aviation 71 Soi Ngamduplee, Rama IV Rd., Tungmahamek, Sathorn, Bangkok 10120	Tel: +66 (2) 286 2918 Fax: +66 (2) 286 1013	jurasit@aviation.go.th
	84.	Mr. Thra Bundechanan Senior Aviation Safety Inspector Flight Standards Bureau Department of Civil Aviation 71 Soi Ngamduplee, Rama IV Rd., Tungmahamek, Sathorn, Bangkok 10120	Tel: +66 (2) 287 3547 Fax: +66 (2) 286 2913	thra@rocketmail.com thraindream@gmail.com

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
85.	Mr. Perapol Begkhuntod	Senior Meteorologist (Specialist) Thai Meteorological Department	Tel: +66 (2) 134 0006-07 Fax: +66 (2) 134 0009-10	pira@tmd.go.th
86.	Mr. Somchai Yimsricharoenkit	Senior Meteorologist Thai Meteorological Department	Tel: +66 (2) 134 0007 Fax: +66 (2) 134 0009	somchai_yim@hotmail.com
87.	Capt. Titiwat Bodhidatta	Manager, International Flight Safety and Operations Development Department Operations Support Department Thai Airways International Public Co., Ltd. 89 Vibhavadi Rangsit Rd., Bangkok 10900	Tel: +66 (2) 545 2665 Fax: +66 (2) 545 3849	flightops@thaairways.com
88.	Capt. Apiluk Permhol	Deputy Manager, International Flight Safety and Operations Development Department Operations Support Department Thai Airways International Public Co., Ltd. 89 Vibhavadi Rangsit Rd., Bangkok 10900	Tel: +66 (2) 545 2665 Fax: +66 (2) 545 3849	flightops@thaairways.com
89.	Mr. Suttipong Kongpool	Vice President, Air Traffic Services Planning and Standards Bureau Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 287 8217 Fax: +66 (2)	suttipong.ko@aerothai.co.th
90.	Mr. Sukluer Chiawarcheep	Vice President, Corporate Policy and Planning Bureau Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 285 9906 Fax: +66 (2)	sukluer.ch@aerothai.co.th
91.	Mr. Nuttawat Supanundha	Vice President, Air Traffic Services Engineering Planning and Development Bureau Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 287 8707 Fax: +66 (2) 287 8166	nuttawat@aerothai.co.th

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	92.	Mrs. Pornnabpan Chootai Director, International Affairs Department Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 285 9680 Fax: +66 (2) 281 8645	pornnabpan@aerorhai.co.th
	93.	Mr. Chainan Chaisompong Executive Officer, Systems Engineering Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 287 8391 Fax: +66 (2) 287 8180	chainan.ch@aerorhai.co.th
	94.	Mr. Kittipong Pongswasdi Senior Administration Officer Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 287 8650 Fax: +66 (2) 287 8645	kittipong@aerorhai.co.th kpongswasdi@hotmail.com
	95.	Mr. Debdhanit Yupho Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 287 8809 Fax: +66 (2) 287 8280	debdhanit.yu@aerorhai.co.th
	96.	Mr. Piyawut Tantimekabut Senior Systems Engineer Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Tungmahamek Sathorn, Bangkok 10120	Tel: +66 (2) 287 8616 Fax: +66 (2) 287 8620	piyawut@aerorhai.co.th piyawut@gmail.com
24.	UNITED STATES OF AMERICA (2)			
	97.	Mr. Daniel Hanlon Federal Aviation Administration Air Traffic Organization International Asia Pacific American Embassy 27 Napier Road Singapore 258508	Tel: +65 6476 9320 M : +65 8163 9294	dan.hanlon@faa.gov

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	98.	Mr. Patrick Power	Senior Representative, North Asia, Attaché Office of International Aviation Federal Aviation Administration U.S. Embassy, No. 55 An Jia Lou Lu Beijing, China (PRC) 100600	Tel: +86 10 8531 3987 Fax: +86 10 8531 4600 pat.power@faa.gov
25.	VIET NAM (2)			
	99.	Mr. Nguyen The Hung	Deputy Director Air Navigation Department Civil Aviation Authority of Viet Nam 119 Nguyen Son Street Long Bien District, Hanoi, SR of Vietnam	Tel: +84 (4) 3872 3600 Fax: +84 (4) 3827 4194 hungand@caa.gov.vn hungand_caav@yahoo.com
	100.	Mr. Nguyen Manh Quang	Director, ATS Department Vietnam Air Navigation Services Corporation (VANSCORP)	Tel: +84 (4) 3873 0320 Fax: +84 (4) 3872 5281 nguyenmq2003@yahoo.co.uk yatmats@vnn.vn
INTERNATIONAL ORGANIZATION				
1.	CANSO (1)			
	101.	Mr. Chiang Hai Eng	Director Asia Pacific Affairs Civil Air Navigation Services Organization (CANSO) Singapore Aviation Academy 1 Aviation Drive, Singapore 499867	Tel: +65 6541 2006 Fax: +65 6543 4995 hai.eng.chiang@canso.org
2.	IACA (1)			
	102.	Mr. Manfred Strierath (observer)	Co-chairman Committee on ATM and Flight Operations International Air Carrier Association (IACA) ATC Coordination, LTU Lufttransport Unternehmen Flughafen, Halle 8, 40474 Dusseldorf	Tel: +49 (211) 9418 896 Fax: +49 (211) 9418 979 manfred.strierath@ltu.de

Attachment 1 to the APANPIRG/20 Report
List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
3.	IATA (4)			
	103.	Mr. Ken Mclean	Regional Director – Safety, Operations & Infrastructure, Asia/Pacific International Air Transport Association (IATA) 111 Somerset Road #14-05 Singapore 238164	Tel: +65 6499 2250 Fax: +65 6233 9286 mcleank@iata.org
	104.	Mr. Owen Dell	Manager International Operations Cathay Pacific Airways 9/F, Central Tower, Cathay Pacific City 8 Scenic Road, Hong Kong Int'l Airport Lantau Island Hong Kong	Tel: +852 2747 8829 Fax: +852 2141 8829 owen_dell@cathaypacific.com
	105.	Mr. Yu Miyata	Japan Airlines International Route Planning, Flight Operations Terminal 1 3-3-2, Haneda, Airport Ota-ku, Tokyo 144-0041 Japan	Tel: +81 (3) 5756 3134 Fax: +81 (3) 5756 3527 yu.miyata@jal.com
	106.	Capt. Kah Kheng Goh	Vice President FLT OPS Tech & Quality Singapore Airlines Limited SIA Training Centre 720 Upper Changi Road East Singapore 486852	Tel: +65 6540 3410 Fax: +65 6490 0601 kk.goh@singaporeair.com.sg
4.	IBAC (2)			
	107.	Mr. Donald D Spruston	Director General International Business Aviation Council (IBAC) Suite 16.33, 999 University St. Montreal, Quebec, H3C 5J9, Canada	Tel: +1 (778) 753 3322 Fax: + dg@ibac.org dspruston@shaw.ca

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NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
	108.	Mr. Patrick Dunn Technical Representative International Business Aviation Council (IBAC) Kiara Designer Suites Mont Kiara, Kuala Lumpur, Malaysia	Tel: +6012 206 5017 Fax: +847 390 7789	pat.dunn@comcast.net
5.	IFALPA (1)			
	109.	Capt. Ian L Getley The Regional Vice President for South Pacific International Federation of Air Line Pilots' Associations (IFALPA) 15 Lucinda Ave., Wahroonga NSW 2076	Tel: +61 (413) 747 727 Fax: +	getleyian@hotmail.com
6.	IFATCA (1)			
	110.	Mr. John WAGSTAFF Representative International Federation of Air Traffic Controllers Associations (IFATCA) Air Traffic Management Division ATC Complex, 1 Control Tower Road Hong Kong International Airport	Tel: +852 2910 6453 Fax: +852 2910 0186	john.wags@gmail.com jwagstaff@cad.gov.hk
7.	SITA (1)			
	111.	Mr. Philip KOH ATM Business Development Manager, Asia Pacific 11 Loyang Way Singapore 508723	Tel: +65 6347 8220 Fax: +65 6548 2606	philip.koh@sit.aero
ICAO Headquarters (2)				
	112.	Mr. H. SUDARSHAN Regional Programme Officer International Civil Aviation Organization 999 University Street Montreal, Quebec, Canada H3C 5H7	Tel: +1 (514) 954 8219 Fax: +1 (514) 954 6077	icaohq@icao.int

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NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
113.	Capt. Dave VanNess	Implementation and Resource Development Coordinator Performance Based Navigation Programme (FLS) International Civil Aviation Organization 999 University Street Montreal, Quebec, Canada H3C 5H7	Tel: +1 (514) 954 8219 ext. 7370 Fax: +1 (514) 954 6759	dvanness@icao.int
ICAO Regional Office (9)				
114.	Mr. Mokhtar A. AWAN	Regional Director International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int
115.	Mr. A. H. TIEDE	Regional Officer, Air Traffic Management International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int atiede@bangkok.icao.int
116.	Mr. Li PENG	Regional Officer, Communications, Navigation and Surveillance International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int pli@bangkok.icao.int
117.	Mr. N. C. SEKHAR	Regional Officer, Aerodrome and Ground Aids International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int nsekhar@bangkok.icao.int
118.	Mr. F. A. SHAH	Regional Officer, Flight Safety International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int fshah@bangkok.icao.int

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List of Participants

NAME		TITLE/ORGANIZATION	TEL/FAX NUMBER	E-MAIL
119.	Mr. S. K. SARASWATI	Regional Officer, Communications, Navigation and Surveillance International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int ssaraswati@bangkok.icao.int
120.	Mr. Kyotaro HARANO	Regional Officer, Air Traffic Management International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int kharano@bangkok.icao.int
121.	Mr. C. KEOHAN	Regional Officer, Aeronautical Meteorology International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	icao_apac@bangkok.icao.int ckeohan@bangkok.icao.int
122.	Mr. John RICHARDSON	ATM Expert International Civil Aviation Organization 252/1 Vibhavadi Rangsit Road Chatuchak, Bangkok 10900	Tel: +66 (2) 537 8189 Fax: +66 (2) 537 8199	

Attachment 2 to the APANPIRG/20 Report
List of Information and Working Papers

LIST OF INFORMATION AND WORKING PAPERS

Paper No.	Agenda Item	Title	Presented by
Information Papers			
IP/1	-	Meeting Bulletin	Secretariat
IP/2	3.6	High Level Safety Conference(2010)	Secretariat
IP/3	3.2	Report of the CAR/SAM Air Traffic Flow Management (ATFM) Regional Project for Latin America (RLA/06/091)	USA
IP/4	2	Update on activities of the ASIA and SOUTH PACIFIC Initiative to reduce emissions (ASPIRE)	USA
IP/5	3.4	U.S. GPS Performance Commitment	USA
IP/6	3.1	Air Navigation Service Providers (ANSPs) Partnership against the spread of influenza and other dangerous communicable diseases	USA
IP/7	3.6	Status of IFFAS Applications for new Regional Technical Co-Operation Projects	Secretariat
IP/8	3.2	Status of ATM-Related Regional Guidance Materials	Secretariat
IP/9	2	US Next Generation Transportation System (NextGen)	USA
IP/10	3.6	The plan on expansion of Training Programmes for Aviation Personnel from Developing countries in the Republic of Korea	Republic of Korea
IP/11	3.6	Control Sector Realignment of Incheon FIR	Republic of Korea
IP/12	3.4	Cost Benefit Study of the initial phase of ADS-B implementation over the South China Sea	CANSO
IP/13	3.2	Continuous Descent Arrivals (CDA)	Japan
IP/14	3.2	RNAV5 Preferential Operation	Japan
IP/15	3.6	Updates on Air Navigation Activities in Viet Nam	Viet Nam

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Paper No.	Agenda Item	Title	Presented by
IP/16	3.6	Status Report of GBAS in Japan	Japan
IP/17	3.4	ATS Data Link Network for implementing delivery of ATIS, VOLMET and Departure Clearance through ACARS Data Link	India
IP/18	3.6	Implementation of Space Based Augmentation System (GAGAN) for APV1.0/1.5 service leading to CAT-1 service	India
IP/19	3.2	Update of AIS/AIM Automation in India	India
IP/20	3.4	Australian ADS-B Aircraft Equipage Mandate – Proposed Revision of Technical Standards	Australia
IP/21	3.4	Status Report of MTSAT and an overview of SOCM	Japan
IP/22	3.6	Work Programme of ICAO Panels and Study Group	Secretariat
IP/23	3.4	PBN Implementation in India	India
IP/24	3.4	PBN Implementation Progress Report	Secretariat
IP/25	3.6	Language Proficiency Implementation Initiative	Nepal
IP/26	3.4	CNS Improvement Activities in Nepal	Nepal
IP/27	3.4	PBN implementation Roadmap	India

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Paper No.	Agenda Item	Title	Presented by
Working Papers			
WP/1	-	Provisional Agenda	Secretariat
WP/2	1.1	Review of the actions of the Air Navigation Commission on the report of the eighteenth meeting of Asia/PAC Air Navigation Planning and Implementation regional Group (APANPIRG/19)	Secretariat
WP/3	1.2	Review of the Status of Implementation of APANPIRG/19 Conclusions and Decisions	Secretariat
WP/4	1.3	Review of the Status of Implementation of APANPIRG Outstanding Conclusions and Decisions	Secretariat
WP/5	2	Transition from AIS to AIM	Secretariat
WP/6	3	Identification of Regional Performance Objectives, Metrics, and introduction to Performance Framework Forms	Secretariat
WP/7	3.1	Report on the Annex 14, Volume I - Requirements on runway surface friction characteristics.	Secretariat
WP/8	3.1	Amendment 10 to Annex 14, Volume I, Aerodrome Design and Operations	Secretariat
WP/9	3.1	Amendment 4 to Annex 14, Volume II, Heliports	Secretariat
WP/10	3.1	Status of implementation of Annex 14, Volume I requirements – Aerodrome Certification and Bird Control Committee	Secretariat
WP/11	3.2	Report of the 19 th Meeting of the ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/19)	Secretariat
WP/12	3.6	Adoption of Global Operational Data Link Document	Secretariat
WP/13	3.2	Current status of RNP4 in Fukuoka Oceanic Airspace	Japan
WP/14	3.3	Report on activities of the RASMAG	Secretariat
WP/15	3.3	Regional Impact Statement on RVSM Height Monitoring	Secretariat
WP/16	3.3	Regional RVSM and Horizontal Safety Performance	Secretariat
WP/17	3.3	Asia/Pacific En-route Monitoring Agency (EMA) Handbook	Secretariat

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Paper No.	Agenda Item	Title	Presented by
WP/18	3.3	Asia Pacific Regional Long Term Height Monitoring	IATA
WP/19	3.4	Report on the Thirteenth Meeting of CNS/MET Sub Group	Chairperson CNS/MET Subgroup
WP/20	3.4	Seminar on Navigation and Surveillance Facilities and Validation of Flight Procedures.	Secretariat
WP/21	3.6	Activities for Environment in Japan	Japan
WP/22	3.4	ASIA/PACIFIC Regional Performance Based navigation Programme Office	IATA
WP/23	3.4	Linking PBN, CDO AND ATC Infrastructure	IATA
WP/24	3.5	Review of ATS Coordination Group Activities	Secretariat
WP/25	3.6	Traffic Forecasts for Trans-Pacific and Intra-Asia/Pacific Region	Secretariat
WP/26	3.6	CANSO Safety Seminar for ANSPs in the Asia Pacific Region	CANSO
WP/27	3.6	Update on ICAO's Environmental Work	Secretariat
WP/28	4	Status of Air Navigation deficiencies in the Asia/PAC Regions	Secretariat
WP/29	5	APANPIRG Work Programme 2010+	Secretariat
WP/30	5	Discussion on the Future ATM System in 46 th DGCA Conference and Proposal on Future ATM System Consideration at the APANPIRG.	Japan
WP/31	3.4	Proposed change to CNS/MET sub group meeting arrangements	New Zealand
WP/32	3.4	Protection of the AMS(R)S Bands for the ASIA/PACIFIC Region and WRC Preparatory activities	Japan
WP/33	3.6	Ionosphere Data Collection toward next solar – Max Period (2011-2012)	Japan

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Paper No.	Agenda Item	Title	Presented by
WP/34	3.4	Satellite data-link operational Continuity meeting	Secretariat
WP/35	6	Administration of APANPIRG	Secretariat
WP/36	3.4	Asia-Pacific Flight Procedure Programme	Secretariat
WP/37	5	Report of Coordination Meeting between Chairman of Sub-Groups	Chairman of Sub Group

Attachment 3 to the APANPIRG/20 Report
Follow-up to APANPIRG/20 Conclusions/Decisions – Action Plan

APANPIRG/20 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/1	Performance Framework Workshop/Seminar	That, ICAO be invited to conduct additional Workshop(s)/Seminar(s) on performance frameworks to provide guidance to the States in developing their national performance frameworks.	Prepare Issue Form	ICAO APAC Office	Issue Form transmitted to HQ	December 2009
C 20/2	Asia Pacific Regional Performance Objectives	That, the Asia Pacific Regional Performance Objectives and associated Performance Framework Forms (PFFs) as contained in Appendix A to the APANPIRG/20 Report on Agenda Item 3.0 be adopted.	a) Notify States b) Include on Regional Office website under APANPIRG	ICAO APAC Office ICAO APAC Office	State Letter Available on website	December 2009 December 2009
C 20/3	Align Regional & National Performance Objectives	That, the Regional Office encourages use by States of the PFF template adopted for the regional PFFs and circulate MS Word soft copy versions of the regional PFFs adopted by APANPIRG to enable States to derive national performance objectives based on the regional objectives.	Notify States	ICAO APAC Office	State Letter	December 2009

Attachment 3 to the APANPIRG/20 Report
Follow-up to APANPIRG/20 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/4	Asia/Pacific Performance Metrics	That the following metrics be adopted as a part of Asia/Pacific regional performance monitoring and measurement:	a) Notify States	ICAO APAC Office	State Letter	December 2009
		APAC Metric 1 Percentage of RMA sub-regions achieving the regional Target Level of Safety (TLS) for RVSM operations, referenced as of April each year. APAC Metric 2 Percentage of instrument runway ends with an approach procedure with vertical guidance. APAC Metric 3 Percentage of en-route and terminal PBN routes implemented on a sub-regional basis in accordance with the regional PBN plan. APAC Metric 4 Average delays for departures at State's primary international airports for the busiest hour on a weekly basis	b) Include on Regional Office website under APANPIRG	ICAO APAC Office	Available on website	December 2009

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Follow-up to APANPIRG/20 Conclusions/Decisions – Action Plan

Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/5	Data Collection for Regional Metrics	That States, organizations and stakeholders collect and process data to support the regional metrics adopted by APANPIRG, leveraging to the extent possible all existing data and ongoing efforts, and provide a progress report to APANPIRG/21.	a) Notify States b) Provide data to regional meetings	ICAO APAC Office APAC States	State Letter Data available to regional meetings and APANPIRG to support metrics	December 2009 Continuous
D 20/6	Dissolution of Western Pacific/South China Sea RVSM Scrutiny Working Group	That, having completed the Terms of Reference established by APANPIRG, a) the Western Pacific/South China Sea RVSM Scrutiny Working Group (WPAC/SCS RSG) be commended for the swift and effective outcomes in satisfactorily addressing RVSM safety performance in the WPAC/SCS area, and b) the WPAC/SCS RSG be dissolved and any residual work items be allocated to Southeast Asia ATS Coordination Group (SEACG) and/or the Regional Airspace Safety Monitoring Advisory Group (RASMAG) and ATM/AIS/SAR Sub-Group as necessary.	a) Notify States b) Transition any remaining items to South East Asia ATS Coordination Group (SEACG)	ICAO APAC Office ICAO APAC Office, SEACG	State Letter Remaining items covered by SEACG	May 2010 May 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/7	Adopt Interim Strategy for Implementation of New Flight Plan Format	That the ‘Interim Strategy for the Implementation of new ICAO Flight Plan Format and Supporting ATS Messages’ provided in Appendix A to the APANPIRG/20 Report on Agenda Item 3.2 be adopted and published as the interim edition, and States and users be urged to commence implementation planning based on the interim strategy.	Notify States	ICAO APAC Office	State Letter	December 2009
C 20/8	Notification of State Transition Date to New Flight Plan Format	That, in order to align regional implementation planning, States inform the Regional Office by 1 July 2010 of their scheduled date and implementation methodology for transition to the new Flight Plan and ATS Message formats.	States formulate implementation strategies	APAC States	Notify Regional Office of methodology and target implementation date	Not later than 1 July 2010
C 20/9	SSR Code Coordination with ORCAM Secretariat	That, recognizing that four of the ten European (EUR) region SSR code Participating Areas (PAs) border Asian States, the Regional Office facilitate coordination with the European Originating Region Code Assignment Method (ORCAM) Secretariat to implement code management arrangements that avoid SSR code conflicts at the EUR/ASIA interface.	Invite ORCAM Secretariat to join coordination	ICAO APAC Office	Letter to ORCAM Secretariat via EUR/NAT Office to invite coordination	February 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/10	ATFM Compliance- Advice to Airlines and Airports	That, on behalf of the ATFM/TF, the Regional Office seeks assistance in properly complying with ATFM procedures from the specific airlines and airports identified by the ATFM/TF as contributing to poor ATFM performance because of early or late departures.	Advise affected States and Airlines	ATFM/TF, ICAO APAC Office	Data provided to ICAO APAC Office Letters containing data transmitted to affected States and Airlines	December 2009 December 2009
C 20/11	ATFM Steering Group and Concept of Operations	That a regional ATFM Steering Group be constituted and tasked with preparing an Asia/Pacific Regional ATFM Concept of Operations based on analysis of regional data and traffic flows. The ATFM Steering Group should consider the outcomes and recommendations from the October 2008 ATFM Seminar/Workshop (Fukuoka, Japan) and information about the CAR/SAM ATFM Project contained in IP/3 to APANPIRG/20 as guidance in deriving its Objectives and Terms of Reference.	Conduct first meeting of Steering Group	ICAO APAC Office	First meeting of Steering group conducted	Second half 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/12	Adopt ATFM Communications Manual	That the <i>Air Traffic Flow Management (ATFM) Communications Handbook for the Asia/Pacific Region</i> , as shown in Appendix B to the APANPIRG/20 Report on Agenda Item 3.2, be adopted and circulated as regional guidance material.	Notify States	ICAO APAC Office	State Letter	December 2009
C 20/13	Conduct Regional ATFM Survey	That a survey of Asia/Pacific States be conducted based on the questionnaire at Appendix C to the APANPIRG/20 Report on Agenda Item 3.2, with the objective of benchmarking the current status of Air Traffic Flow Management (ATFM) activities in the Asia/Pacific Region.	Conduct survey	ICAO APAC Office	Survey conducted and outputs compiled	March 2010
D 20/14	Support for Global ICD for AFTN AIDC	That recognizing the benefits to be gained from globally harmonized interface arrangements for AIDC, APANPIRG supports the work being undertaken by the United States to coordinate a global Interface Control Document for AFTN AIDC and invites the Asia/Pacific Regional Office to act as the regional point of contact for this work.	Notify States	ICAO APAC Office	State Letter	February 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/15	Survey of RNP 4 Equipage and Approvals	That during 2010 the Regional Office conducts a regional survey to establish the current and near term equipage and approvals status for RNP 4 operations.	Conduct survey	ICAO APAC Office	Survey conducted and outputs compiled	March 2010
C 20/16	Assistance to States to Implement Electronic Terrain and Obstacle Data (eTOD)	That, in light of the fact that: a) within the Asia and Pacific region, there is a varying degree of implementation status and readiness for the existing Annex 15, Chapter 10 eTOD Standards and Recommended Practices (SARPs); b) significant cost and institutional issues prevail as impediments to global eTOD implementation; and ICAO consider providing short- and long-term assistance to States in order to build their capacity to provide eTOD in a sustainable and cost efficient manner. <i>Note: An appropriate form of providing assistance could include establishment of an ICAO Technical Cooperation Project with funding sought from donor agencies.</i>	Prepare Issue Form	ICAO APAC Office	Issue Form transmitted to HQ	December 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/17	SAR Guidance on 121.5 MHz Search Planning	Recognizing that large populations of aircraft would continue to use 121.5MHz distress beacons after the February 2009 cessation of COSPAS SARSAT Satellite tracking capability, States consider the guidance material “ <i>Search Planning for Audible 121.5 Distress Beacon Alerts</i> ” contained in Appendix G to the APANPIRG/20 Report on Agenda Item 3.2 when developing SAR procedures and training documentation.	Notify States	ICAO APAC Office	State Letter	February 2010
C 20/18	Provide SAR 121.5 MHz Guidance to ICAO/IMO JWG	That the Regional Office seek the assistance of the United States in providing a copy of the guidance material “ <i>Search Planning for Audible 121.5 Distress Beacon Alerts</i> ” contained in Appendix G to the APANPIRG/20 Report on Agenda Item 3.2 to the ICAO/IMO Joint Working group on SAR for consideration as an amendment to the <i>International Aeronautical and Maritime SAR (IAMSAR) Manual</i> .	Coordinate with USA	ICAO APAC Office	Regional Office Letter	February 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 20/19	ATM/AIS/SAR Task List	That the ATM/AIS/SAR Sub-Group Task List and attachments contained in Appendix A to the ATM/AIS/SAR/SG/19 Report on Agenda Item 10 be adopted as the current work programme for the ATM/AIS/SAR Sub-Group of APANPIRG.	Notify ATM/AIS/SAR Sub Group	ICAO APAC Office	Working Paper to next ATM/AIS/SAR Sub Group meeting	June 2010
C 20/20	Adopt RVSM Minimum Monitoring Requirements	That the RVSM Minimum Monitoring Requirements (MMRs) shown in Appendix B to the APANPIRG/20 Report on Agenda Item 3.3 be adopted as the MMRs applicable for the Asia/Pacific Region.	a) Notify States b) Include on Regional Office website under “APAC eDocuments”	ICAO APAC Office ICAO APAC Office	State Letter Available on website	December 2009 December 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 20/21	Expand use of safety monitoring data	That the arrangements for annual month of December traffic sample data by all States to satisfy airspace safety monitoring analysis called for by APANPIRG Conclusion 16/4 be expanded to enable this data to also be available for airspace planning and implementation purposes. This will apply only where such data is not otherwise available to regional or State implementing bodies and only with specific written authority of the ICAO Asia/Pacific Regional Office on each occasion.	Notify States prior to annual December traffic sample data collection	ICAO APAC Office	State Letter	November 2009
C 20/22	Provide Annual Update of RVSM Approvals to RMAs	That, in addition to the continuous update of RVSM Approvals data called for by Conclusion 19/15 and APANPIRG RMA requirements, States provide an update of RVSM Approvals data in conjunction with the annual December traffic sample data submission required by Conclusion 16/4.	a) Notify States prior to annual December traffic sample data collection b) States provide RVSM Approvals data	ICAO APAC Office APAC States	State Letter States provide update of RVSM Approvals status to APANPIRG RMAs as part of December traffic sample data submission	November 2009 January 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/23	Adopt RVSM Monitoring Impact Statement	That the <i>Asia/Pacific Regional Impact Statement – RVSM Global Long Term Height Monitoring Requirements effective from November 2010</i> , as shown in Appendix C to the APANPIRG/20 report on Agenda Item 3.3, be adopted and circulated as Asia/Pacific regional guidance material.	c) Notify States	ICAO APAC Office	State Letter	December 2009
			d) Include on Regional Office website under “APAC eDocuments”	ICAO APAC Office	Available on website	December 2009
D 20/24	En-route Monitoring Agency (EMA)	That the term En-route Monitoring Agency (EMA) be used to describe an organization providing airspace safety assessment, monitoring and implementation services for international airspace in the Asia/Pacific Region to support implementation and operation of reduced horizontal (lateral and longitudinal) separation.	Notify States	ICAO APAC Office	State Letter	December 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/25	Adopt En-route Monitoring Agency (EMA) Handbook	That the <i>Asia/Pacific En-route Monitoring Agency (EMA) Handbook</i> , as shown in Appendix D to the APANPIRG/20 report on Agenda Item 3.3, be adopted and circulated as Asia/Pacific regional guidance material.	e) Notify States	ICAO APAC Office	State Letter	December 2009
			f) Include on Regional Office website under “APAC eDocuments”	ICAO APAC Office	Available on website	December 2009
D 20/26	Revision of Subject/Tasks List of ATNIGG	That, the revised Subject/Tasks List of ATNIGG provided in Appendix A to the Report on Agenda Item 3.4 be adopted.	Notify ATNIGG WG/6 and ATNIGG	ICAO APAC Office	ATNIGG informed and paper prepared	September 2009 May 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/27	ATN/AMHS Guidance Material	That, the following guidance materials for ATN/AMHS Implementation be adopted and published. - Version 3.1 of the Asia/Pacific IDRP Routing Policy provided in Appendix B to the Report on Agenda Item 3.4; - AMHS/ATN Network Management Operational Procedure Guidelines provided in Appendix C; - Amended AMHS Conformance Testing (AMHS Manual provided in Appendix D; and - Aeronautical Telecommunication Network Security Checklist provided in Appendix E.	Publish on website	ICAO APAC Office	Published on website. States notified	October 2009
C 20/28	Short-term procedure for Global AMHS address Coordination	That, ICAO request States to register their AMHS addresses with EUROCONTROL AMC through Aeronautical Radio of Thailand (Aerothai) and provide a copy of this information to ICAO Asia/Pacific Office.	Notify States	ICAO APAC Office	State Letter	November 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/29	AMHS Addressing Scheme	That, a) States be urged to update information in respect of their administrations in the regional AMHS Naming Register; and b) States hosting BBIS hubs be requested to process both the XF and CAAS addressing schemes.	Notify States	ICAO APAC Office	State Letter	November 2009
C 20/30	Revision of FASID Tables CNS-1B, CNS-1C and CNS-1E	That, FASID Tables CNS-1B, 1C and 1E for ATN Router Plan, AMHS Routing Plan and AIDC Routing Plan be replaced with the revised CNS Tables provided in Appendices F, G and H respectively to the Report on Agenda Item 3.4.	Prepare amendment proposal	ICAO APAC Office	Amendment proposal to HQ	March 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/31	State and Operator aircraft information for GOLD	That, a) States be urged to provide Region & State Information for inclusion in the GOLD Appendix E, by sending the completed forms(s) provided in Annex 1 to the Report on agenda item 3.4 for their flight information regions (FIRs) or control areas (CTAs) by 30 October 2009; and a) IATA be urged to coordinate with member airlines for providing operator & aircraft information for the GOLD Appendix F by sending completed form(s) as provided in Annex 2 to the Report on agenda item 3.4 for each variance, clarification, or addition to applicable aircraft type by 30 October 2009.	Notify States	ICAO APAC Office	State Letter	September 2009
C 20/32	Second Satellite Data-link Operational Continuity Meeting	That, ICAO be invited to organize 2 nd Satellite Data-link Operational Continuity Meeting in 2010 for stakeholders to review the developments on the performance and provision of satellite data link communication in the Asia/Pacific Region and develop a solution.	Coordination and organize SOCM/2 Meeting	ICAO APAC Office	Meeting conducted	October 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/33	Coordinate Implementation of Reduced Horizontal Separations with CSPs	That, recognizing the technical limitations in satellite data link communications capability for the provision of ADS-C and CPDLC, States intending to implement reduced horizontal separations based on RNAV 10 and RNP 4 PBN specifications in oceanic and remote area commence early coordination with Communication Service Providers (CSPs) in order to ascertain adequate data link communication/surveillance capability to support the proposed implementation. Outcomes should be recorded in a formal Service Level Agreement (SLA) between implementing States and CSPs, jointly or severally, to ensure that capabilities are available to properly support RCP 240/D specifications contained in Appendices B and C to the GOLD on an ongoing basis.	Notify States	ICAO APAC Office	State Letter	January 2010
C 20/34	Technical Limitations in Satellite Data Link Communications Capability	That, recognizing current technical limitations in satellite data communications capability that impacts PBN based separation applications particularly for RNAV10 and RNP 4 in the remote and oceanic areas, ICAO be invited to address this issue at global level.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent HQ	December 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/35	Asia-Pacific Flight Procedure Programme	That, States be encouraged to participate in the Asia-Pacific Flight Procedure Programme in order to build or improve their instrument flight procedure capabilities, meet the PBN implementation goals of Assembly Resolution A36-23 and enhance flight safety, efficiency and environmental protection.	Notify States	ICAO APAC Office	State Letter	SL T6/13.11.2- AP089/09 & follow-up letter had been issued on 29 July 09.
C 20/36	Preparation for PBN Implementation	That, States that have not done so, are urged to develop their State PBN Implementation Plans, and take action in accordance with those plans to implement WGS-84 and Electronic Terrain and Obstacle Data in their States.	Notify States	ICAO APAC Office	State Letter	November 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/37	Guidance material for PBN Implementation	That, ICAO be invited to develop guidance materials on: a) establishing common implementation rules and technical standards for GNSS reporting and prediction requirements; b) assigning PBN capability to GPS IFR aircraft in the first instance without the need for recertification; and c) PBN-specific aspects of en-route safety assessment.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent HQ	December 2009
D 20/38	Regional RAIM prediction System	That, PBNTF be tasked to examine the feasibility of establishing a regional RAIM prediction system.	Notify PBNTF	ICAO APAC Office	PBNTF informed and paper prepared	February 2010
C 20/39	RNAV Human Factors	That, RNAV safety message provided in Appendix J to the Report on Agenda Item 3.4 be distributed to the States for further distribution to all operators involved in RNAV operations in order to apply the lessons learnt.	Notify States	ICAO APAC Office	State Letter	November 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/40	PBN Implementation Progress Report Template	That, States be urged to use the PBN Implementation Progress Report Template provided in Appendix K to the Report on Agenda Item 3.4 for all future reporting of their status of PBN implementation. The Report should be submitted at each of the future PBN Task Force Meeting.	Notify States	ICAO APAC Office	State Letter	A SL had been sent to States on 4 Aug09) urging States to provide progress report using the template.
C 20/41	Asia/Pacific Regional PBN Implementation Plan	That, the Asia/Pacific Regional PBN Implementation Plan provided in Appendix L to the Report on Agenda Item 3.4 be adopted as Version 1.0.	Notify States	ICAO APAC Office	State Letter	November 2009
C 20/42	PBN Safety Assessment Training	That, ICAO be requested to assist in addressing the PBN safety assessment training needs in the region.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent HQ	December 2009
C 20/43	RNP AR Approach Implementation	That, States be urged to give detailed considerations to the operational need, safety and cost benefits prior to deciding on RNP AR Approach implementation.	Notify States	ICAO APAC Office	State Letter	November 2009
D 20/44	PBN Task Force Activities	That, the PBN Task Force continues with the current TORs for two additional meetings in 2010.	Notify PBNTF	ICAO APAC Office	PBNTF informed and paper prepared	February 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/45	Sharing Information on ICAO Panels/SGs	That, ICAO be requested to consider sharing information on ICAO Panels and Study Groups activities/outcome regularly with regional planning/implementation groups.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent HQ	December 2009
C 20/46	Revision of the Strategy for the Provision of Navigation Services in the Asia/Pacific Region	That, the updated Strategy for the provision of navigation services provided in Appendix M to the Report on Agenda Item 3.4 be adopted and published.	Notify States	ICAO APAC Office	State Letter Updated Strategy posted on website	November 2009
D 20/47	Guidance material for flight inspection/validation of ADS-B ground stations	That, ADS-B SITF be tasked to study the need for developing guidance material for flight inspection/validation of ADS-B ground stations.	Notify ADS-B SITF	ICAO APAC Office	ADS-B SITF informed and paper prepared	April 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/48	Flight Inspections and Validation of Flight Procedures	That, ICAO be invited to: a) carry out a study for use of DGPS as a positioning reference system for flight inspection; b) provide guidelines for selecting GP reference point for flight inspection; c) review areas of possible misinterpretations in ICAO Doc 8071 such as the ones shown in Appendix N to the Report on Agenda Item 3.4 and provide necessary guidance on the interpretation of the ICAO requirements in order to avoid inconsistency of interpretations and to harmonize application of ICAO Standards and Recommended Practices; d) review information on flight validation as contained in ICAO Doc 8071 Volume II consequent to new Doc 9906 Volume V becoming applicable; and e) develop templates for flight validation reports for PBN IFPs including RNP APCH procedure. A sample template developed by Aerorhail for RNP APCH is provided in Appendix O to the Report on agenda item 3.4.	Prepare Issue Form	ICAO APAC Office ICAO HQ	Issue Form sent HQ	December 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/49	Update of procedures and infrastructure	That, the States be a) reminded of the contents of State Letter AN 7/5-01/52 dated 11 May 2001 on ILS maintenance procedures; b) reminded to provide updates to information as contained in the eighth edition of the flight inspection catalogue; and c) urged to consider upgrading their FIS to include the flight inspection requirements of GNSS, Interference, ADS-B, Multi-lateration etc. as necessary.	Notify States	ICAO APAC Office	State Letter	November 2009
D 20/50	Subject/Tasks List of ADS-B Study and Implementation Task Force	That, the Subject/Tasks List for ADS-B Study and Implementation Task Force provided in Appendix P to the Report on Agenda Item 3.4 be adopted.	Notify ADS-B SITF	ICAO APAC Office	ADS-B SITF informed and paper prepared	April 2010
C 20/51	Workshop on ADS-B OUT equipage requirement	That, ICAO be invited to organize a workshop on ADS-B OUT equipage requirement before May 2010 with the assistance from Australia and USA.	Organise the workshop	ICAO APAC Office, Australia and USA	The workshop conducted	April 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/52	Table CNS 4A and Table CNS 4B	That, the FASID Table CNS 4A and Table CNS 4B be replaced with updated Tables provided in Appendix Q and Appendix R to the Report on Agenda Item 3.4 in accordance with the established procedure.	Prepare amendment proposal	ICAO APAC Office	Amendment proposal to HQ	March 2010
C 20/53	Revised Guidelines for Development of ADS-B Implementation Plan by States	That, the revised guidelines for Development of ADS-B Implementation Plan by States provided in Appendix S to the Report on Agenda Item 3.4 be adopted.	Notify States	ICAO APAC Office	State Letter Updated Strategy posted on website	November 2009
C 20/54	Regional ADS-B Equipage Requirement	That, States be urged to issue ADS-B authorizations for the interim period 2010-2020 (or until requirements can be harmonized globally) in Non-Radar Areas (NRA) airspace based on: - AMC20-24 certification or - Approval by CASA Australia or - The requirements of the CASA Civil Aviation Order 20.18 Amendment (No. 1) 2009 and Advisory Circular AC21-45 <i>Note: States that have not yet published regulations should implement necessary regulations that recognize that any one of the above requirements is acceptable and not specify an individual requirement.</i>	Notify States	ICAO APAC Office	State Letter	December 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/55	Forward Fitment Requirements for SA Aware and FDE functionality	That, ICAO recommends States concerned to adopt forward fitment requirements which include SA aware and FDE functionality as soon as reasonable.	Notify States	ICAO APAC Office	State Letter	December 2009
C 20/56	Coordination for SSR MODE S II Codes	That, a) the Table on SSR Mode S Interrogator Identifier Codes as provided in Appendix T on Agenda Item 3.4 to the Report be adopted; and b) States be advised to provide the required information as specified in the Table on SSR Mode S Interrogator Identifier Codes to the ICAO Asia/Pacific Office for coordination and registration.	Notify States	ICAO APAC Office	State Letter	January 2010
C 20/57	Planning Criteria for SSR Mode S II Code Assignment	That, the Planning criteria for SSR Mode S II code coordination and assignment as provided in Appendix U to the Report on Agenda Item 3.4 be adopted as a provisional guidance material for use in the Asia/Pacific Region.	Notify States	ICAO APAC Office	State Letter	January 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/58	ICAO Position for the World Radio Communication Conference – 2011 (WRC-11) Agenda Items	That, States be urged to: a) integrate ICAO Position on WRC-11 Agenda Items into their State Position presented to the regional telecommunication forum (APG) involved in the preparation of joint regional position on the Agenda Items; b) include ICAO Position on WRC-11 Agenda Items into the State Position to the extent possible; c) undertake to provide experts from their civil aviation authorities to participate in the development of State and regional positions; and d) ensure to the extent possible, State delegation to regional conferences, ITU Study Groups and WRC should include experts from Civil Aviation authorities.	Notify States	ICAO APAC Office	State Letter	October 2009

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
D 20/59	Use of the public Internet to access OPMET data and WAFS forecasts	That, OPMET data and WAFS forecasts currently distributed through the ISCS, if only used for flight planning, can be considered non-time critical and therefore, can be accessed through the public Internet. <i>Note: Relevant ICAO guidance will be updated accordingly, subject to consideration of a similar decision by the WAFSOPSG/5 Meeting and subsequent endorsement by ANC.</i>	(with regards to the note) – ANC consideration	ICAO HQ	Updated guidance material if clarity is needed	Nov 2010
C 20/60	Extension of the ISCS-G2 and the implementation of the WAFS Internet file server (WIFS)	That, WAFS Washington Provider State advise the ISCS user States about its intentions to: a) continue to work on extending the current ISCS-G2 service through 30 June 2012 to allow users sufficient time for transition to replacement services; and b) provide an operational WAFS Internet File Server (WIFS) by March 2010.	Inform States of ISCS-G2 cessation date Develop WAFS Internet File Server (WIFS)	WAFS Washington Provider State/ APAC Office WAFS Washington Provider State	ISCS website update/ State Letter WAFS products available by Internet	Dec 2009 Mar 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/61	Replacement of ISCS-G2	That, a) the ICAO Regional Office, in coordination with the ISCS Provider State, prepare a survey to be circulated to the ISCS user States and focal points on their intentions as to the future reception of OPMET data and WAFS forecasts, i.e. ISCS-G3 vs. WIFS; <i>Note 1: the survey would include pros and cons of the two systems, together with the associated cost estimates, to be provided by the ISCS Provider State and seek information about the States' capability to assume these costs in view of establishing possible funding arrangements.</i> <i>Note 2: the Secretariat request States to revalidate their respective focal point to further promote coordination between the ISCS Provider State and the user States in the Asia/Pacific Region.</i>	Develop and disseminate survey	ISCS Provider State / ICAO APAC office	Survey results	1 Dec 2009
			Update ISCS focal points	ICAO APAC office	Updated ISCS focal point list	Nov 2009
		b) after completion of action under a) above by 1 December 2009, the ISCS Provider State inform the ISCS user States concerning their plans for the replacement of the ISCS-G2; and	Inform ISCS user States of ISCS-G2 replacement system plans	ISCS Provider State / ICAO APAC office	Update ISCS website / State Letter	Feb 2010

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		<i>Note 3: the ISCS Provider State is expected to indicate its future plans concerning ISCS-G3 and the WIFS</i> c) the WAFSOPSG be invited to consider preparing an amendment to all ICAO regional procedures in the ANP/FASID to render WIFS and SADIS FTP Service as an alternative to the respective satellite broadcasts as the primary means of obtaining WAFS forecasts and OPMET data for flight planning purposes. <i>Note 4: WAFS user States are responsible for the procurement of the necessary tools to access WAFS forecasts and OPMET data provided by the WAFCs.</i> <i>Note 5: The adoption of this Conclusion reinstates the APANPIRG Conclusion 19/45, Transition to ISCS 3rd Generation.</i>	Update ANP/FASID	ICAO HQ (through WAFSOPSG)	Amendment Proposal to ANP/FASID (if deemed necessary by WAFSOPSG/5)	Jan 2010

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C 20/62	Harmonization of procedures for OPMET data issuance	That, ICAO Regional Office be invited to				
		a) Include examples of correct methods of issuing OPMET data for inclusion in the ROBEX Handbook;	Update ROBEX Handbook	ICAO APAC Office	Updated ROBEX Handbook	Oct 2009
		b) After completion of a) above request States in the Asia/Pacific Region to implement these methods as a matter of priority; and	Inform States	ICAO APAC Office	State Letter	Oct 2009
		c) Consult the RODBs to monitor the progress of OPMET data issuance in compliance with the Regional Air Navigation Plan for reporting at the OPMET/M TF/8 Meeting.	RODB monitoring of OPMET compiling/filing times	RODBs / ICAO APAC Office	Inclusion of monitoring results in OPMET/M TF/8 Report	Apr 2010

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C 20/63	Improvement of OPMET data availability for AOP aerodromes	That, after the next round of harmonization of OPMET data between SADIS and ISCS Provider States,	SADIS/ISCS harmonization	ISCS and SADIS Provider States/ ICAO APAC Office	ISCS/SADIS OPMET harmonization	Oct 2009
		a) IATA be invited to monitor the availability of OPMET data for AOP aerodromes; and	IATA OPMET monitoring	IATA	Table of AOP aerodromes not available on SADIS	Dec 2009
		b) ICAO Regional Office, based on the results of the monitoring in a) above, remind States concerned of unavailability of OPMET data.	Inform States	ICAO APAC Office	State Letter	Jan 2010
		<i>Note: the aim will be an availability of 95% of all OPMET data (METAR and TAF) from AOP aerodromes on SADIS and ISCS.</i>				

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/64	Improvement of OPMET data availability for non-AOP aerodromes	That, after the next round of harmonization of OPMET data between SADIS and ISCS Provider States,	SADIS/ISCS harmonization	ISCS and SADIS Provider States/ ICAO APAC Office	ISCS/SADIS OPMET harmonization	Oct 2009
		a) IATA be invited to monitor the availability of OPMET data for non-AOP aerodromes; and	IATA OPMET monitoring	IATA	Table of AOP aerodromes not available on SADIS	Dec 2009
		b) ICAO Regional Office, based on the results of the monitoring in a) above, approach States concerned to confirm their agreement to continue providing OPMET data <i>Note: the aim will be an availability of 90% of all OPMET data (METAR and TAF) from non-AOP aerodromes on SADIS and ISCS.</i>	Inform States	ICAO APAC office	State Letter	Jan 2010
C 20/65	Replace FASID Tables MET 4A and 4B by the ROBEX Handbook	That, the FASID Tables MET 4A and 4B be replaced with the ROBEX Handbook when referencing the ROBEX Scheme in the Basic ANP and FASID in accordance to Appendices V and W to the APANPIRG/20 Report on Agenda Item 3.4. Subsequently, FASID Tables MET 4A and 4B will be removed from the FASID.	Update ANP/FASID	ICAO APAC Office	Amendment Proposal to ANP/FASID	Dec 2009

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C 20/66	Replace FASID Table MET 4C by the Asia/Pacific regional OPMET data banks interface control document	That, the FASID Tables MET 4C be replaced with the Asia/Pacific regional OPMET data banks interface control document when referencing the responsibilities of the ASIA/PAC OPMET data banks for collection and dissemination of OPMET bulletins to support the ROBEX Scheme in the Basic ANP and FASID in accordance to Appendices V and W to the APANPIRG/20 Report on Agenda Item 3.4. Subsequently, FASID Table MET 4C will be removed from the FASID.	Update ANP/FASID	ICAO APAC Office	Amendment Proposal to ANP/FASID	Dec 2009
C 20/67	Cost Recovery by Volcano Observatories	That, the ICAO CNS/MET Sub-group VA/TC Implementation Task Force, in coordination with the VAAC Provider States and the ICAO Secretariat, be invited to investigate examples of agreements between State volcanic observatories and the civil aviation authorities that may be used by other States in considering the recovery of the cost in accordance with ICAO provisions.	Investigate cost recovery examples by volcanic observatories	VA/TC I TF/ VAACs/ ICAO HQ (IAVWOPSG)/ ICAO APAC Office	State Letter	June 2010

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Conclusion/ Decision No --- Strategic Objective*	Title of Conclusion/Decision	Text of Conclusion/Decision	Follow-up Action	To be initiated by	Deliverable	Target date
C 20/68	Expanded WV SIGMET Test Development	That,	Develop WV expansion SIGMET test	Japan/ VAAC Darwin	Updated WV expansion SIGMET Test	Apr 2010
		a) Japan be invited to further develop an expanded WV SIGMET Test utilizing automated templates in consultation with the Darwin VAAC; and b) upon completion of a) above, Japan conducts the expanded WV SIGMET Test and produce an analysis to the OPMET/M TF/8 meeting for further review and subsequent reporting to the CNS/MET SG/14 meeting to determine the next phase of the test.	Conduct and report on trial test	Japan	Test results included in OPMET/M TF/8 and CNS/MET SG/14 reports	Apr 2010 / Jul 2010
C 20/69	Implementation of SIGMET on Radioactive Clouds and Aerodrome Warnings on Tsunami	That, in view of clarifying existing Annex 3 provisions, a) the IAVWOPSG consider developing Annex 3 provisions and guidance material, as necessary, related to the issuance of SIGMET on radioactive clouds; and b) ICAO consider developing Annex 3 provisions and guidance material as necessary related to the issuance of aerodrome warnings on Tsunami.	Proposals to develop provisions and guidance material on radioactive cloud SIGMET and Tsunami aerodrome warnings	ICAO HQ	Amendment criteria to be included in Am. 76 or 77 to Annex 3, as necessary; guidance	2013 or 2016

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C 20/70	Training on QMS	That, WMO, in coordination with ICAO, be invited to organize a seminar/workshop on QMS related to aeronautical meteorological services during the first half of 2010.	Conduct QMS Seminar/ Workshop	WMO/ICAO HQ/APAC Office	Seminar/Workshop	June 2010
D 20/71	Updated Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group	That, the revised Terms of Reference and Subject/Tasks List of the CNS/MET Sub-group provided in Appendices Y and Z to the Report be adopted.	Notify CNS/MET SG	ICAO APAC Office	CNS/MET SG informed and paper prepared	July 2010
C 20/72	Ionospheric Data Collection – Focal Point of Contact	That, the States be urged to: a) cooperate with each other to collect data and characterize ionosphere model in the APAC region that will lead to smooth introduction of GNSS in ASIA/PAC Region; and b) provide the name and contact details of the Focal Point of Contact to ICAO Regional Office for coordinating collection and exchange of ionospheric data with the ultimate objective of establishing a standard ionospheric model for the region.	Notify States	ICAO APAC Office	State Letter	January 2010

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C 20/73	Adopt GOLD to replace FOM	That, upon release of the Global Operational Data Link Document (GOLD) by the Ad-Hoc GOLD Working Group in first quarter 2010, the FANS-1/A Operations Manual (FOM) be withdrawn and replaced by the GOLD as Asia/Pacific regional guidance material for use by States and airspace users as the basis for operating Automatic Dependent Surveillance – Contract (ADS-C) and Controller Pilot Data Link Communications (CPDLC), in conjunction with <i>Annex 10 – Aeronautical Telecommunications Volume II – Communications Procedures including those with PANS status</i> and the <i>Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM Doc 4444)</i> .	Notify States	ICAO APAC Office	Upon release of the GOLD by the AD-Hoc GOLD Working Group, transmit State Letter	First quarter 2010
C 20/74	Removal of the APANPIRG Air Navigation Deficiency AP-MET-15	That, the air navigation deficiency AP-MET-15 be removed from the APANPIRG air navigation deficiencies list.	Update list of APANPIRG air navigation deficiencies	ICAO APAC Office	Updated list of APANPIRG air navigation deficiencies	Dec 2009

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C 20/75	MET deficiencies to be added to the APANPIRG list of Air Navigation Deficiencies	That, the list of proposed air navigation deficiencies in Appendix F to the APANPIRG/20 Report on Agenda item 4, obtained by the ICAO TCB CAEMSA-SP reports be added to the list of APANPIRG air navigation deficiencies list tagged with the U status.	Update list of APANPIRG air navigation deficiencies	APAC Office	Updated list of APANPIRG air navigation deficiencies	Dec 2009
C 20/76	Continuation of CAEMSA-SP	That, the DGCA/46 conference considers funding and resources be allotted by donor States, WMO, and ICAO for the continuation of the CAEMSA-SP in order to meet international requirements in the provision of meteorological services which would achieve the necessary safety and efficiency levels for airlines operating in the South Pacific.	Provide necessary means for the continuation of CAEMSA-SP	DGCA Conference	Continuation of CAEMSA-SP	Oct 2009

* **Note:** ICAO has established the following Strategic Objectives for the period 2005-2010:

A: Safety - Enhance global civil aviation safety; **B: Security** - Enhance global civil aviation security; **C: Environmental Protection** - Minimize the adverse effect of global civil aviation on the environment; **D: Efficiency** - Enhance the efficiency of aviation operations; **E: Continuity** - Maintain the continuity of aviation operations; **F: Rule of Law** - Strengthen law governing international civil aviation.